MEAT INSPECTION

PETERS.

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W. J. Mack

GUIDE TO

Practical Meat Inspection,

Including Examination for Trichina,

—BY—

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TRANSLATED FROM THE THIRD NEWLY REVISED EDITION, WITH ANNOTATIONS AND ADDITIONS BY

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U. S. MEAT INSPECTION LAWS.

ILLUSTRATED WITH 46 FIGURES AND 14 PLATES.

Richard W. Peck.

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PREFACE.

In the preparation of this text the translator has endeavored to produce a work which shall so far as possible convey the idea of Dr. Fischoeder, who wrote the book, as a practical guide to Stock Inspectors not only during their course of instruction but also during their active work as inspectors. No claim is made that this is a complete scientific discussion; on the contrary, technicalities have been studiously avoided. The German laws have been omitted since they differ so radically from our own. As a substitute, the United States meat inspection regulations and instructions to inspectors as to various points in carrying these into operation have been inserted. For the use of these I wish to acknowledge my thanks to Dr. D. E. Salmon, Chief of the Bureau of Animal Industry, who also kindly rendered his valuable assistance in other ways in this translation.

I desire also to express my thanks to Dr. S. Stewart, for many years Chief of the Microscopical Division of the Bureau of Animal Industry at Kansas City, who by carefully reading the text and suggesting many annotations, has been of material aid. I likewise extend thanks to Mr. Vergil C. Barber, Assistant Animal Pathologist of the U. S. Experiment Station, University of Nebraska, for assistance in the translation of the work, and to Mr. Alex Eger, of Chicago, publisher of this work, for kindly compiling the general index. For the loan of plates and figures I am thankful to the following: Department of Animal Pathology, U. S. Experiment Station, University of Nebraska, plates 6-8 and figures 8-11 and 13; Department of Entomology, State University of Louisiana, plates 1-5; Dr. C. A. Cary, Veterinarian of the U. S. Experiment Station of Alabama, plates 9-14, and Dr. M. Stalker, of the Ames Agricultural College, figure 12.

A. T. P.

ERRATA.

Page 30, line 2 from bottom, read 2¼ for 1¼.
Page 33, line 2 from top, read "are used" for "is used." Line 4 from top, read "vessels" for "vessel."
Page 37, line 2 from top, read "lines" for "lead from."
Page 38, bottom line, read "122" for "123."
Page 40, figure 3, read "measle worm" for "meat worm." Line 2 from top of note, read "posterior" for "posteriorly."
Page 50, paragraph numbered 5, read "externaliliac" for "internaliliacae." Read "from and" for "from the.". Omit punctuation after "animals."
Page 55, line 15 from top, read "lard" for "large."
Page 96, line 6 from bottom, read "sections 2-4, pages 84-87" for "paragraphs 2 and 4, pages 83-84 and 85."
Page 110, line 1 at top should begin with quotation marks. Fig. 8-Anthrax is from Fraenkel & Pfeiffer.
Page 122, line 8 from bottom, read "carcasses" for "carcass."
Page 127, line 14 from top, read "Chorioptes" for "Chroioptes."
Page 143, line 16 from top, read "remind" for "reminds."
Page 149, line 6 from top, read "granular" for "grandular."
Page 154, line 12 from bottom, read "navel" for "naval."
Page 156, line 16 from top, read "caseated" for "vaseated."
Page 166, line 3 from bottom, read "or rostrum" for "of rostellum."
Page 175, line 10 from top, omit (Figs. 27-35.).
Page 180, line 12 from bottom, omit "and" at beginning of line.
Page 182, line 12 from bottom should precede line 11.
Page 193, line 8 from top, read "articulations" for "articulation."
Page 214, line 5 from bottom omit (see Figure 8.).
Page 225, line 10 from bottom, insert "one" before "another."
Page 234, line 8 from top, omit remainder of paragraph after "trichina."

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I. OBJECT OF MEAT INSPECTION AND MEAT INSPECTORS.

The term "Meat Inspection" implies the examination of animals before and after being slaughtered.

The purposes of meat inspection are:

1. *Protection of human health against harm and destruction.* Meat dangerous to health and unfit for human food is set aside and excluded from commerce. This is the chief object of meat inspection.

2. *Control of meat inspection.* There are many diseases in which the meat is not at all dangerous to health, but is of little value. Meat inspection guards against the substitution of diseased meat for sound meat, and informs the buyer as to the nature of the defects in the faulty meat. The butter traffic (butterine) and also the milk traffic (adulterated milk) in many cities are regulated in a similar manner.

3. *Prevention of spread of infectious diseases.* By examining the animal both before and after slaughtering, the infectious diseases are easily discovered, and by the application of the legal measures described above, as well as by the proper disposal of the different infectious material and parasites, their further spread is effectively checked.

Formerly physicians were regarded as the proper officials for the inspection of meat. At present the opinion and conviction of not only the public, but also of those in authority, has opened the way whereby the veterinarians are the professionals appointed for this work. Veterinarians are persons who, upon the ground of their science and experience, are in a position to satisfy the demands placed upon them by meat inspection. Therefore the practice of meat inspection rests in the hands of the veterinarians.

On account of the constantly increasing number of public slaughter houses, and on account of the consequent spread of meat inspection, it has become necessary, especially for economy's sake, to entrust the practice of meat inspection to other individuals who are not qualified veterinarians. Such persons are called "stock inspectors," and are to the veterinarian what the nurse or midwife is to the physician.

The stock inspector is independent insofar as he, upon his own responsibility, has to inspect the slaughtered animal and determine whether the flesh is sound or diseased. His chief task consists in the recognition of healthy meat. This he allows to pass for commercial use. In case the animal or flesh is diseased a veterinarian is called to make the examination. Only in positively undoubted cases may he independently judge as to diseased meat.

It is an important responsibility that the stock inspector assumes in the performance of his duties; the health and life of man as well as his property, are at stake. Therefore the tasks of a meat inspector can only be performed by one who has gained the trust placed upon him through the greatest accuracy in the proper exercise of his duty and who has gained the necessary recognition. To be fitted for this position, the meat inspector must have a desire and love for the business, as well as zeal and perseverance. Otherwise he will always be a bungler and a blunderer, even though he has passed the examination and has been employed.

II. CONSTRUCTION AND FUNCTIONS OF THE ANIMAL BODY.

I. ANIMAL TISSUE.

Although the individual parts of the animal body, i. e., bones, blood, liver, flesh, brain, etc., appear to be different, they all agree in that they are made up of the very smallest, single bodies called cells. Countless masses of such cells compose every organ, and therefore the entire animal. The cells are

held together by means of connective tissue, as bricks are by mortar. The different tissues take on fat cells, lime, pigment matter and the like, and thus form bones, cartilage, fatty tissue, etc; others assume definite shapes and properties and form the peculiar elements of the organs. For example, muscle cells, nerve cells, blood cells (blood corpuscles) and gland cells (liver, stomach, salivary gland and mammary gland cells).

By this means they also undertake a definite work which they have to perform for the welfare of the whole body. Just as in an organized state or government each officer must perform a definite work which is assigned to him, so each individual cell or the cell groups in the body perform their definite work.

2. BONES.

The bones constitute the framework of the body and are joined to one another movably (by joints) or immovably (by sutures). They are divided into (a) bones of the head, (b) bones of the trunk, (c) bones of the limbs.

(a) The bones of the head are divided into cranial bones (spheroid, occipital, interparietal, parietal, ethmoid, frontal and temporal), and facial bones (superior maxillary, intermaxillary, nasal, zygomatic, lachrymal, palatine, pterygoid, vomer, hyoid, inferior maxillary and turbinate). Compound bones, the most of which are in pairs, are immovably joined to each other by means of sutures, with the exception of the hyoid and superior maxillary bones, the former being supported by cartilage and the latter by the maxillary joint. The head is joined to the vertebral column by means of the occipital joint.

The cranial bones form the cranial cavity. This is provided with single, small foramina for the admittance of nerves and blood vessels and is entirely surrounded by bones and extends back into the spinal canal. The facial bones form the nasal cavity, and the framework of the mouth cavity. The nasal cavity has secondary cavities (superior maxillary, frontal and spheroid cavities). At the margins of the superior maxil-

lary, intermaxillary and inferior maxillary bones, the teeth are embedded in the tooth cavities. After the first teeth (milk-teeth) have fallen out, the permanent teeth take their place. They are classified into incisors, tusks and molars.

SYNOPTICAL TABLE OF THE BONES AND TEETH OF ANIMALS TO BE SLAUGHTERED.

	Horse	Cow	Sheep	Goat	Swine
(a) *Bones.*					
Cervical Vertebrae....	7	7	7	7	7
Dorsal "	18	13	13	13	14 (15)
Lumbar "	6 (5)	6 (7)	6 (7)	6 (7)	7 (6)
Sacral "	5	5	5 (3-4)	5 (3-4)	4
Coccygeal "	17–19	18–20	18–21	10–12	20–22
True Ribs.....	8	8	8 (7)	8 (7)	7
False "	10	5	5 (6)	5 (6)	7 (8)
Carpals.....	7 (8)	6	6	6	8
Metacarpals	3*	3*	3*	3*	4
Front toes(of each limb)	1	2**	2**	2**	4
Tarsals	6 (7)	5	5	5	7
Metatarsals	3*	3*	3*	3*	4
Hind toes.....	1	2**	2**	2**	4
(b) *Teeth.*					
1. In the upper jaw..					
Incisors.....	6	0	0	0	6
Tusks.....	2***	0	0	0	2
Molars.....	12	12	12	12	14
2. In the lower jaw.					
Incisors.....	6	8	8	8	6
Tusks.....	2	0	0	0	2
Molars.....	12	12	12	12	14

NOTE.—The figures enclosed in parentheses indicate the more common exceptions.—*The lateral ones are short and thin.—**Besides two dew-claws.—***Lacking in the mare.

(b) The vertebral column composed of separate vertebrae, constitutes the foundation of the trunk. The vertebrae are divided into cervical, dorsal, lumbar, sacral and coccygeal vertebrae.

Each vertebra is made up of a body and an arch. Both form the spinal foramen. Through the spinal foramena of the vertebrae lying in succession the spinal canal proceeds and opens into the occipital foramen. The spinal canal is

covered with connective tissue between the occipital bone and the first cervical vertebra, and hence accessible without injury to the bones. Between the separate vertebrae the inter-vertebral foramina lead from the canal and serve for the admission of nerves and blood vessels. Each vertebra has a spinous process above, articular processes before and behind, and transverse processes at the sides. The vertebrae are differentiated according to the size and functions of these processes. The cervical vertebrae have short spinous and transverse processes. The dorsal vertebrae have articular surfaces on the transverse processes for connection with the ribs. The lumbar vertebrae have long transverse processes. The sacral vertebrae are grown together to form the sacral bone or sacrum. The coccygeal vertebrae have rudimentary processes.

The ribs are joined to the vertebrae by small articulations running outward in the form of an arch, and extend around to the sternum. The foreribs (true ribs) reach the sternum, while the hind-ribs (false ribs) attach themselves to the fore-ribs by means of cartilaginous ends. The dorsal vertebrae, ribs and sternum form the thorax or chest cavity.

(c) There are two anterior and two posterior limbs.

The anterior limbs are joined to the body only by muscles and tendons. The bones of the fore-limbs are shoulderblade (scapula), upper-arm (humerus), fore-arm (radius and ulna), fore-knee (carpals), metacarpus with rudimentary metacarpals or splints, and toe bones (pastern, coronet and coffin bone, with several sesamoidal bones.

The posterior limbs are joined to the vertebral column by means of the pelvis. The bones of the posterior limbs are: Upper-leg, (femur), fore-leg (tibia and fibula), patella, hock (tarsals), metatarsus with rudimentary metatarsals or splints, and toe as in the anterior limb.

3. THE MUSCLES.

The skeleton is covered with muscles which are composed of single muscle fibres lying next to one another and thus

forming muscle bundles. (See also page 12.) By means of connective tissues the muscle bundles are joined to still larger bundles, and in this way form the large muscle masses which in common language are called "flesh."

The muscles are fastened by their ends to different bones and have the property of being able to contract. In this manner is accomplished the movement of not only each separate member, but of the entire animal. Generally, however, the muscles are not fastened directly to the bones, but their ends taper into longer or shorter connective tissue strands (tendons) or tendonous membranes by which they are fastened.

Besides producing motion the muscles are capable of spreading themselves out flatwise and fastening to different parts widely removed from one another. They also surround various body cavities. Thereby the body has its peculiar form.

4. THE BODY CAVITIES.

In the animal body, aside from the above mentioned cranial cavities and the different unimportant ones, are the following cavities:

(a) The thoracic cavity has a bony framework; the sternum below, the vertebral column above, and the ribs at the sides. In front, the narrow space between the first ribs on both sides is filled with connective tissue, the trachea, oesophagus, blood vessels and nerves. The posterior limit is formed by the diaphragm, a flat muscle, which with two thick portions (diaphragm pillars) begins at the lumbar vertebrae, extends forward and downward to the sternum and joins laterally to the false ribs. In the middle the diaphragm is sinewy. The thorax is thus a completely enclosed cavity in which are found the organs of breathing (lungs) and of circulation (heart with the large vessels). In addition to these, various nerves and the gullet pass through the thorax.

The inner walls of the thoracic cavity are entirely covered with a thin membrane (pleura), which also overlies the entire

organs contained in the cavity. The pericardium is a double fold of the pleura which surrounds the heart in the form of a completely enclosed sac. It is well to note that the covering of all the organs lying in the thorax is one and the same membrane, notwithstanding the names it bears in each separate place (pulmonary pleura, costal pleura, mediastinal pleura and pericardium). Hence diseases of the whole part will always be seen as diseases of one organ, and it is therefore difficult to distinguish between diseases of the covering (serous membrane) and the organ itself.

(b) The abdominal cavity is separated from the thoracic cavity in front by the diaphragm; above, it is bordered by the vertebral column; on the sides and below by the abdominal muscles and the peritoneum; posteriorly it reaches to the pelvic cavity. Thus it is not entirely enclosed as is the thorax, nor has it the complete bony framework. In the abdominal cavity lie the stomach, intestines, liver, pancreas, spleen, kidneys, a part of the urinary bladder and the uterus and ovary (in female animals), besides blood and lymph vessels and nerves.

The abdominal cavity is likewise lined with a thin membrane (peritoneum), which completely covers all the organs excepting the kidneys and the ovaries. The covering, however, is not so symmetrical and regular as in the thoracic cavity, but in certain places it is present in such masses as to form large folds which hang free in the abdominal cavity, or serve as supports. The omentum for example, is just such a fold, between both membranes of which lie vessels and nerves. In a similar abdominal fold which hangs to the vertebral column, are found the intestines. This fold is called the mesentery and contains in addition to blood and lymph vessels, the nerves and lymph glands of the intestines. Between these folds as well as between the abdominal wall and the peritoneum is deposited more or less fat (mesentery fat, kidney fat), according to the condition of the animal.

(c) The pelvic cavity lies behind the abdominal cavity and is surrounded by the pelvis, the sacrum and the first coccygeal

vertebra. In this cavity lie the rectum, the vagina (in female animals) and the urinary bladder.

(d) The nasal cavity is separated into two lateral halves by a cartilagenous septum. These halves are sub-divided by means of the turbinate bone into several divisions (nasal ducts). The nasal cavity is lined with mucous membrane. The entrance to the two nasal cavities is formed by the nostrils. The posterior nasal duct becomes narrow and leads into the throat cavity.

(e) The maxillary and palate bones form the bony framework for the mouth cavity, which is bordered laterally by muscles (buccal), below by the tongue, above by the palate, and is lined with a rather tough membrane. The entrance into the mouth cavity is between the lips (mouth). The exit from the mouth cavity leads into the throat cavity.

(f) The throat cavity is a muscular sac lined with a mucous membrane. Both the nasal and mouth cavities open into this, from which lead the larynx with the trachea, which goes to the lungs, and the pharynx, which becoming the gullet, leads through the thoracic cavity, penetrates the diaphragm and ends in the stomach. In addition to these, two narrow tubes (eustachean tubes) lead from the throat cavity to the ears.

5. THE SKIN.

The animal body is covered externally with the skin (hide), which changes to mucous membrane on the natural body openings (mouth, nose, eyes, ears, anus, vagina, penis, urethra and teats).

The skin consists of an epidermis, a cutis vera and a dermis. The cutis vera is the true skin which comes off when the hide is tanned. It possesses special muscles for special movements upon the body (face, neck, shoulder and abdominal cutaneous muscles). Outwardly it forms the epidermis, which consists of small scales which drop off and are again renewed by the cutis vera. Inwardly the cutis vera forms the dermis, which presents

a loose connection between the skin and the body, and contains more or less fat (lard in swine), according to the condition of the animal.

The deposition of fat in a few places beneath the skin serves the examiner to judge as to the condition of the animal, which is confirmed by the so-called "handling." The "handling qualities" are tested at the rump (laterally beneath the tail), flank, foreudder (in front of the udder, in bulls at the scrotum), ribs (in the upper third of the last ribs), foreflank (behind the shoulder blade), foreshoulder (in front of the shoulder joint), and breast (on the front part of the breast).

The hair, horns and hoofs are special formations of the skin. They are built up and renewed by the skin.

6. DIGESTION.

For the maintenance of the animal body and for the execution of the demands placed upon it, it requires nourishment which is contained in food. In order to extract the nourishment and assimilate it, the animal must take in food. Food contains albumen, fat, sugar and starchy material (carbohydrates), salt and water.

The process by which the animal takes in the food, consumes it, extracts the nourishment and assimilates it for its special purpose, is called digestion. Every animal, therefore, possesses a digestive apparatus. This is a canal that begins at the mouth and ends at the anus. It is made up of three coats. The inner is the mucous coat, the middle the muscle coat, and the outer the serous or connective tissue coat. In the mucous coat are glands which secrete fluids. By means of these fluids the necessary substances are first extracted from the food, by its passage through the digestive tract, then liquified and carried into the body. However, these glands in the mucous coat do not suffice for supplying the requisite fluid, and so the alimentary canal is provided with a number of special organs (salivary glands, pancreas and liver), which secrete digestive

fluids and introduce them into the digestive tract by means of small canals (excretory ducts). The movement of the food substances, as well as the mixing of same, is accomplished by progressive contractions (peristaltic motion) of the muscular walls of the alimentary canal.

The length of the digestive tract depends upon the ease or difficulty with which the nourishment is extracted from the food by the animal. In dogs, which eat easily digestible food (meat), the intestinal canal is only about five times as long as the dog itself. While in sheep, which partake of food which is hard to digest (hay and straw), this canal is twenty-eight times as long as the sheep itself.

The food is masticated in the mouth and saturated with saliva. It then passes through the gullet into the stomach, where, for the greater part, it is digested by the gastric juice. The portion undissolved in the stomach goes into the intestine and is further digested by means of the fluids of the intestinal glands (intestinal juice), the pancreatic gland (pancreatic juice), and the liver (gall). That portion still remaining undecomposed is voided through the anus as excrement.

The ruminants (cattle, sheep and goats) make an exception to this manner of digestion insofar as they do not grind the food when they take it in, but swallow it unground. It does not pass directly into the stomach, but first into the so-called ante-stomach, which consists of three parts: (a) first stomach (paunch or rumen), (b) second stomach (reticulum), (c) third stomach (omasum). Ruminants eat such food as the true stomach (fourth stomach or abomasum) cannot digest. The hard hulls surrounding the food lodge first in the paunch, where they are softened. They are then forced back into the mouth, thoroughly masticated, saturated with saliva and passed into the fourth stomach, where true digestion begins. In young ruminants which take milk or other easily digestible food, the fourth stomach is largest, while in older animals in which the food must be previously prepared for digestion, the paunch has the largest distension.

FIG. I.

CIRCULATION OF THE BLOOD.

(Born and Möller.)

The arteries are dark, the veins light.

The arrows indicate the direction of the blood.

The valves with their tendons are seen in the ventricles.

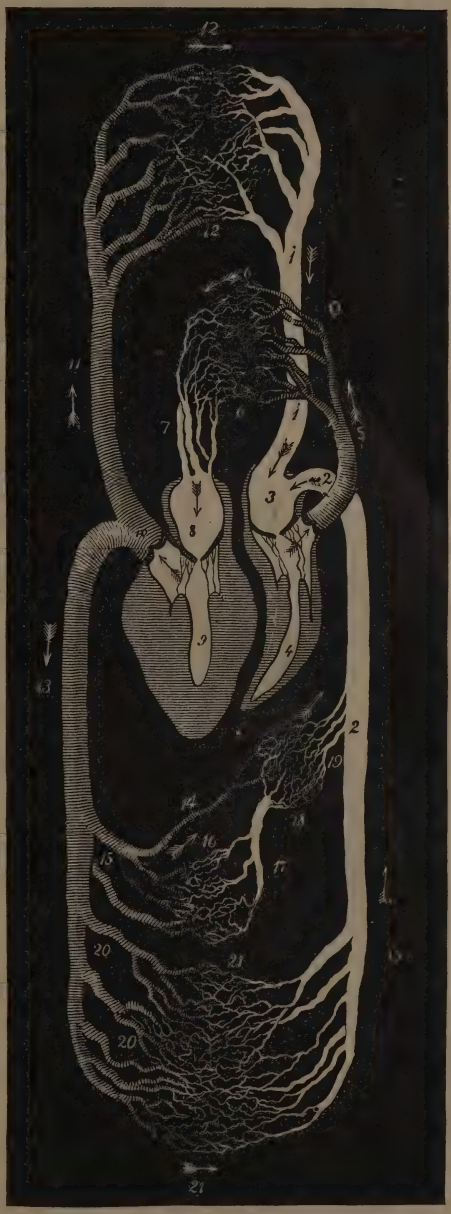
Nos. 4–8: Minor Circulation.

Nos. 15–19: Portal Circulation.

Above at No. 21 are the blood vessels of the anterior body portion.

Below at No. 21 are the blood vessels of the posterior body portion.

1. Anterior Vena Cava.
2. Posterior Vena Cava.
3. Right Auricle.
4. Right Vetricle.
5. Pulmonary Artery.
6. Pulmonary Capillaries
7. Pulmonary Veins.
8. Left Auricle.
9. Left Ventricle.
10. Aorta.
11. Anterior Aorta.
12. Capillaries of the Anterior Body Portion.
13. Posterior Aorta.
14. Hepatic Artery.
15. Mesenteric Arteries.
16. Mesenteric Capillaries
17. Mesenteric Vein.
18. Hepatic Capillaries
19. Hepatic Veins.
20. Arteries of the Posterior Body Portion.
21. Capillaries of the Posterior Body Portion.



7. RESPIRATION.

Besides food, the animal also requires fresh air (oxygen). This they absorb partly through the exterior skin and the mucous membranes. This cutaneous respiration, however, does not suffice. More special organs are provided for this purpose, by means of which the oxygen of the air is taken up, and the useless gas (carbonic acid) accumulating in the body is expired. These are the lungs.

There is a right and a left lobe of the lungs, each of which is divided into separate lobes. The structure of the lungs may best be compared with that of a tree. The trunk is the trachea which begins with the larynx, enters the thoracic cavity between the first pair of ribs, and divides into the right and left bronchial tubes. Each of these branches divides into still smaller branches (branchioles) and these again into smaller and smaller branches. As leaves hang on the smallest branches, these tubes terminate in vesicles.

When the muscles of respiration stretch the diaphragm (inspiration), the air rushes through the nasal cavity, the larynx and the trachea into the lung vesicles. Here occurs the interchange between the exterior air which supplies the oxygen, and the body air laden with carbonic acid. When the respiratory muscles contract (expiration), the thoracic cavity becomes smaller, the air, containing little oxygen but rich in carbonic acid, rushes from the lungs in the same manner. This process of respiration is continually repeated at rather regular intervals.

8. CIRCULATION.

The blood is composed of serum (water of the blood) and white and red blood-corpuscles. The red blood corpuscles impart the red color to the blood. The blood does not flow freely in the body, as it appears to do as shown when a part of the body is wounded, but is confined in tubes called blood vessels.

The blood circulates through the body in these blood vessels, the circulation being accomplished by means of the action of the heart.

The heart is a hollow muscle shaped like a cone, and is divided by a septum into a right (smaller) and a left (larger) half. Each of these halves is sub-divided into an upper, smaller (auricle), and a lower, larger (ventricle) division. Thus the heart contains a right and left auricle and a right and left ventricle. (Fig. 1.) These chambers are so arranged that there is a connection between the auricle and ventricle of the same side, but not between the separate sides.

A large vessel (aorta) leads from the left ventricle and, like the trachea, divides at once into two main branches (anterior and posterior aorta). These divide into still smaller branches and thus penetrate the whole body, as they finally are resolved into very fine tubes (hair-vessels or capillaries). These extremely small vessels combine again into larger and larger ones, and finally unite into two main branches (anterior and posterior vena cava) which empty into the right auricle. Likewise from the right ventricle a main branch (pulmonary artery) leads to the lungs and here divides in a similar manner into the lung capillaries, which re-unite and become the pulmonary vein which empties into the left auricle.

Thus there is distinguished the major (systemic) and minor (pulmonary) circulation. From the right ventricle the blood flows through the arteries into the body, and thence through the veins back to the right auricle (systemic circulation). From the right auricle the blood flows through the pulmonary arteries into the lungs and thence through the pulmonary veins back to the left auricle (pulmonary circulation). (Fig. 1.)

The action of the heart, by means of which is accomplished the circulation of the blood, takes place so that the two auricles contract first, and then the two ventricles. By the contraction of the auricles the blood is forced into the ventricles. When the contraction of the auricles ceases, the ventricles contract and force the blood through the arteries into the body.

Meanwhile the auricles have again filled from the veins. Now begins the same occurrence anew, which is constantly repeated, and in succession. At the openings leading from the auricles into the ventricles, and from the ventricles into the arteries, are valves which prevent the blood from returning. The action of the valves causes the heart-sounds which can be distinctly heard by placing the ear upon the left side of the breast just above the elbow. The action of the heart may be tested by placing the finger upon an artery lying superficially to the bones, for example, the external maxillary artery or the femoral artery. It will then be noticed that the artery fills firmly in response to the heart beat (pulsation).

In the circulation of the blood special stress is to be laid upon the following:

1. In the spleen the arteries do not pass into capillaries, but end simply with exposed openings, thus allowing the blood to flow in the unwalled sinuses of the spleen pulp. From these sinuses small veins arise which unite to form larger ones. On account of this structure the practice of meat inspection is important, because diseases due to the introduction of injurious material into the blood system, affect the spleen first, as they are directly in contact with its contents.

2. The veins coming from the gastro-enteric canal, in order to pour their blood into the right auricle, do not pass into still larger veins, but go first into the liver, where they are once more resolved into capillaries, and then meet as larger veins that lead to the heart. The blood, laden with nourishing material and coming from the alimentary canal, does not go immediately into the general circulation, but passes first to the liver and here unloads the food material, which is not to be used at once. The liver is therefore to be compared with a storehouse in which the food after digestion is stored up for future use as necessity demands. On account of this connection by means of vessels between the alimentary canal and the liver, diseases of the alimentary canal can easily be transmitted to the liver. Hence diseases of the alimentary canal are also always

demonstrated in the liver, although the disease may not as yet have reached this organ.

9. LYMPH.

The oxygen taken from the lungs, and the food material taken into the blood from the alimentary canal are carried by the blood to the various parts of the body, and continually ooze through the walls of the capillaries in the tissues. The cells now assimilate the food stuff and employ it according as it is needed for their own support and for that of the whole body. For example, the liver cells form the gall, the salivary glands the saliva, the testicles the semen, the mammary glands the milk, etc.

However, the cells cannot employ all of the substances that flow to them through the blood. On the other hand, the action of the cells produces waste products, which would completely submerge them if special provision were not made whereby the useless material and that thrown off by the tissues are removed. This is accomplished by means of the lymph vessels.

Between the individual cells are lymph spaces, which combine to form sinuses, which in turn form a compact network of small tubes. These tubes, like the veins, gather into still larger vessels, and finally as two main branches (thoracic and right lymphatic duct), empty into the large veins, and these conduct their contents again into the blood. However, not only is the useless material and that thrown off by the cells, carried from the organs by means of the lymph vessels, but also all foreign substances which gain entrance in some way or another, for instance, by disease, wounding, poisoning, and the like.

It would be very severe upon the entire body if these substances could pass into the blood through the lymph vessels without further ceremony and poison the whole system. To prevent this, there are located along the lymph vessels at certain intervals large and small lymphatic glands, which oper-

ate like filters and keep the harmful substances from entering the blood.

The color of the lymphatic glands differs not only in the same species of animals, but also in the same individual animal and even in the same parts of the body. It is not uniform in shade, but is alternately patched, regularly or irregularly, chiefly with bright and dark colors. Old, lean animals have larger and darker colored lymph glands than young, fat animals. In the lymph glands of cattle the darker color predominates (dark-gray, grayish-blue to grayish-black). In swine and calves, on the other hand, the lighter color predominates (bright-gray, reddish-gray and yellowish-gray). The color in sheep and goats is midway between. The individual lymph glands are discussed under organs.

All foreign material is arrested in the lymph glands, and is rendered harmless, or else it diseases the gland under the influence of the resulting contamination. In a short space of time follows disease of the glands lying adjacent to the heart. Thus the lymph glands may become diseased from one another until finally the poison gets into the blood circulation and sets up a general blood poisoning. For example, if a wound on the finger is infected by a poisonous substance, the finger swells and the small lymph glands of the wrist become diseased. Soon the glands of the elbow likewise swell, then the shoulder glands, and finally a general blood poisoning results. Each organ and each member of the body possesses lymph vessels in whose course are embedded vast numbers of larger or smaller lymph glands. When the organ or member becomes diseased the lymph glands also become diseased. This sensibility of the lymph glands is so delicate that often those diseases, which produce only such slight changes in the organ itself that they can be detected with much difficulty or not at all, will in each case show easily recognizable changes in the lymph glands belonging thereto, which fact is especially important to the meat inspector.

To detect the condition of an organ or a member that appears apparently healthy, the meat inspector does not first un-

dertake the uncertain and time-consuming examination of the entire animal, but he first accurately tests the corresponding lymph glands. If these prove to be free from changes, he is justified in concluding that the corresponding organ or member is healthy. On the other hand, if the lymph glands show any changes, the organ or member is also affected, and there is occasion for the usual accurate systematic examination of the part. Hence, it is quite necessary for the practical meat inspector to know the exact position of the various lymph glands, and from what members the lymph vessels go that lead to the separate lymph glands, and in each examination to direct his attention to the lymph glands. By attending to this point the meat inspector will detect many changes in the organs that otherwise would escape him absolutely.

10. EXCRETION.

In the process of digestion, whereby useless material is eaten and digested, and especially in that process whereby the excretions of the cells are again taken into the blood, the blood would soon be over-charged with these substances were it not for the fact that special organs are provided to remove this excess. The kidneys serve this purpose. They collect this material and from it manufacture urine, which flows from the kidneys through the ureters to the bladder, and from there through the urethra to the outside.

The material passed out through the anus is that which cannot be digested. That which goes through the kidneys has certainly been digested, yet it cannot be utilized by the cells, and a portion of it is the waste product constantly flowing from the cells themselves. The waste products in the form of gas (carbonic acid) is thrown off through the lungs.

11. REPRODUCTION.

Animals have the power to propagate, that is, to bring forth other animals like themselves. For this purpose the animals possess special organs (sexual organs), which prepare the gen-

erative fluids (semen and ovum). The male animals produce the semen, the female the ovum. Semen and ovum **must** unite to form a new animal.

The semen is prepared in the testicles which lie in the scrotal sack. By the act of copulation the semen is injected into the vagina. It contains the spermatozoa, which force their way from the vagina into the womb and unite with the ovum.

The ovum is formed in the ovary, frees itself from the latter and passes through the fallopian tube into the womb. After uniting with the male semen here it starts to develop. The womb continually expands, and the young animal, after complete development, is forced out (born).

The time at which the ovum ripens in the female and is expelled, is called "oestrum." This occurs in the horse on the sixth to the ninth day after parturition, and recurs every four weeks; in the cow, three weeks after parturition and recurs every three to four weeks; in swine, after weaning the shoats, and recurs every three to four weeks; in sheep, six to eight weeks after parturition, and recurs every three weeks.

During "oestrum" the animals show decided symptoms that may have a similarity to the symptoms of other diseases (i. e., rabies). The conduct of the animals changes; they become restless and excited; on the contrary, others become more quiet; they cover one another, urinate copiously, play with the clitoris, lift up the tail, etc. The lips of the vulva are swollen. A slimy, sometimes somewhat bloody exudate flows from the vagina. These phenomena disappear as soon as the animal has conceived, and do not reappear during pregnancy.

In horses pregnancy lasts from forty-eight to forty-nine weeks, in cattle forty weeks, in sheep twenty-one and one-half weeks, in swine seventeen weeks. During this time the animals show symptoms which, especially toward the end of pregnancy, have a few similarities to the symptoms of gastro-enteritis, mammitis and parturient apoplexy. The circumference of the abdomen becomes larger, the round form

is lost and the back sways. Toward the end of this period the udder swells; the swelling often extending forward to the navel. The blood vessels of the udder protrude plainly. Two or three days before parturition single drops exude from the teats, the musculature of the back falls in, the mucous membrane becomes red, considerable mucous is secreted and the vulva is greatly swollen.

After the birth of the young animal, the placenta in which it was embedded in the womb is passed out (after-birth). After parturition the vulva and udder remain swollen for a few days. A secretion passes from the vagina, which soils the tail. This secretion lasts in cattle often as long as fourteen days. It is at first brownish, then more of a dirty gray, and finally glassy in appearance. It is easily distinguished from the secretions that occur in parturient apoplexy.

III. SEX AND AGE OF THE ANIMAL.

1. SEX.

Among the males and females are those animals which have had their testicles (castrated), or ovaries (spayed) removed. The following are to be noted:

In cattle: Bull (male), cow (female), calf (either sex until six months old), bullock (young male), steer (castrated male from one year to four years old), ox (castrated male over four years of age), and heifer (female that has not yet given birth.)

In horses: Stallion (male), mare (female), gelding (castrated male), foal (either sex, until weaned), colt (male, until four years old), filley (female, until four years old, or until bred), and ridgling (male in which one testicle has not descended into the scrotum).

In sheep: Ram (male), ewe (female), wether (castrated male), and lamb (either sex, until one year old). In meat traffic sheep are called wethers regardless of sex.

In goats: Billy (male), nanny (female), and kid (either sex, until one year old).

In swine: Boar (male), sow (female), barrow (castrated male), shote (growing animal), pig (female animal that has not been bred [gilt], and male of same age).

The male animals are strongly built and have a highly developed musculature, especially at the neck and shoulders. In the boar, the skin on the shoulder is cartilaginous in appearance. The billy goat and the boar have a characteristic, unpleasant odor which also permeates the flesh. This odor remains with the animal even for a short time after castration.

2. AGE.

The teeth are the best indicators of the age of an animal. The incisors are called nippers (pincers), situated one on each side of the median line, intermediates (laterals), external to the nippers, and corners, external to the intermediates. The intermediates in ruminants are called first and second laterals, as there are two located on each side. The milk teeth are smaller and have a whiter color than the permanent teeth.

TABLE SHOWING TIME OF CUTTING THE PERMANENT INCISORS.

	They are cut in the			
	Horse	Cattle	Sheep	Swine
	at the age of			
Nippers	2½ years	1½ years	1 year	1 year
Intermediates	3½ years	.....	.....	1¼–1½ years
First laterals	.....	2½ years	1½–2 years	.....
Second laterals	.....	3¼–3½ years	1¼–2¾ years	.....
Corners	4½ years	4¼–4½ years	3–3½ years	¾ years

The age of cattle over four and one-half years old may be approximately determined from the fact that the tooth roots grow out farther and the spaces between the teeth become larger. At the age of twelve to fifteen years most of the teeth drop out. In cows the age may also be determined by the horns, as a ring is formed on the horn during each period of

gestation, which generally occurs every year. By counting these rings and adding two to this number the age is determined, provided gestation has occurred regularly. Unequal distance between the rings shows plainly that the animal has not calved at regular intervals.

With calves the age is at first indicated by the condition of the navel, later by the teeth and horns. The navel is at first dirty-gray, constantly grows darker and finally becomes black. Four or five days after birth it becomes dry, and at eight days drops off, healing over at three weeks, forming a scab which is shed at four weeks. Improper removal of the navel and diseases of the same change this course. At the time of birth calves generally have six incisors; the gums, however, lie even with them. During the first week the corners break through. At two weeks the gums draw back from the first laterals, at three weeks from the second laterals and at four weeks from the corners, so that by this time all the incisors are cut and the gums are swollen.

Development of horns: At the age of two weeks the skin begins to thicken at the place where the point of the horns are to appear; at four weeks the hair falls out at that place; at two months it has all fallen out and the points which form the tips of the horns are plainly visible. These tips are movable up to three months, and at four to six months they become fast.

In sheep the teeth are worn down sooner than in cattle. The spaces between the teeth appear earlier and the dropping out of the permanent teeth begins earlier.

IV. THE NORMAL CHARACTERS OF THE ORGANS.

I. THE BLOOD.

The blood flowing from the severed blood vessels flows freely and has a cherry-red color which becomes brighter when exposed to the air. Animals fatigued or heated, or suffering from acute diseases have darker colored blood. The blood clots shortly after being drawn. The clot can be prevented from forming by heating or beating (defibrinating). Blood

used in the manufacture of sausage should not be allowed to clot. For the manufacture of said article, the blood of swine is the best, yet that of cattle and calves is used. Sheep blood is used chiefly for commercial purposes. The blood from animals which have had their throats cut is not adapted for human food, because as a rule the contents of the stomach flowing from the severed gullet, are mixed with the blood, which soon spoils.

In slaughtering, the quantity of blood collected amounts on an average to about 20-25 liters in the horse, 15-20 in cattle, 2-3 in swine, 1-1½ in sheep and 1-1½ in calves. Healthy, strong animals bleed better than weak, sickly ones. Fat, round ones have less blood than those rather well nourished of a blocky form. Even with the most thorough bleeding only one-half of the entire amount of blood is obtained, while the other half remains in the body. The blood may be caught more easily by stabbing the animal in the breast than in the throat. However, if the breast stab is not properly done the blood does not flow out, but flows into the thorax between the lungs and the thoracic wall (internal hemorrhage). The blood is not removed until the animal is inspected after being slaughtered.

When the animal is completely bled, death occurs. A short time after this, twitching is seen in different parts. These are simply involuntary movements caused by the spinal cord. In spite of the fact that the animal is unconscious, nothing more should be done with him until these movements cease. This can be determined in swine by pouring hot water over the region of the flank, and in other animals by striking the coronet of the hoof with a knife. These movements last longer in young, sound, strong or pregnant animals than in old, "run-down" unhealthy ones.

2. THE SKIN.

After death has occurred the skin is removed with the exception of that on the coronet (in cattle and calves), on the

entire head (in calves) and on the mouth (in cattle). These parts are scalded and after the hair is removed, is used for human food. The inner surface of the skin, on well bled animals, is white or bluish white, the blood vessel containing no blood.

With swine the entire skin is left on the flesh and afterwards scalded and the hair removed. The skin of swine, even on black ones, is made pure white by scraping, washing and scouring. It is only gray colored swine that are not rendered white by this process. In swine which are placed in the heat of the sun or in damp cold, or those which are scalded before they are entirely dead, the skin shows bright red points (see page 132). The cartilaginous, thickened skin on the shoulder of the boar is not eaten, but serves for commercial purposes.

3. THE HEART, LUNGS AND LIVER.

(a) The LUNG is colored a bright rose, is smooth and shining upon the surface and plainly shows division into fields, which unite to form larger fields or lobules. The lung feels soft to the touch, crackles upon being cut, and the cut surface likewise shows the division into lobules. The trachea as well as its branches are lined with an almost white mucous membrane.

In the lungs are found three groups of lymphatic glands: the bronchial glands and the anterior and the posterior mediastinal glands. These glands are easiest found by taking up the aorta with the left hand, and making the following cut with the right hand: In the lower one-third of the posterior mediastinum, midway between the aorta and lobes of the lungs (posterior mediastinal gland), farther above, the anterior mediastinal gland, and between the aorta and the bifurcation of the trachea, the bronchial glands. The lymphatic glands are soft and colored yellow or yellowish-white, and oftimes contain black nodules. (See Figure 2).

The following characteristics serve to distinguish the lungs of the various animals:

The lung of the horse is slightly lobed; the lung of cattle has 4-5 right and 2-3 left lobes; the lung of swine has 3-4 right and 2-3 left lobes; the lungs of calves and sheep are lobed the same as those of cattle. In proportion to the size of the lungs the trachea and its branches are thicker in calves than in swine and sheep. The lungs of calves are soft to the touch, and the apices are more rounded. The lungs of swine and wethers are firmer to the touch and the apices are rather sharp. The lung of sheep is more of a bright red, and firm; the goat lung is more of a bright red, and soft, and hair generally clings thereto.

Mention should be made of a few important changes occurring in the lungs, which, as a rule, do not affect the value of the lung, but which must be known to the meat inspector, because its recognition is necessary in order to distinguish the diseased condition of the lung. Moreover, they are familiar to every butcher, and therefore the meat inspector must likewise be familiar with them in the interest of his position.

1. Punctiform and general blackening either of the entire lung or single fields is most rare. It is found only here and there in calves and cattle. The lymphatic glands likewise are black. Otherwise the lung has a normal appearance.

2. It is often the case that single lobes of the lung do not contain air. (Atelectasis). These parts are brownish red, contracted, firm, and do not crackle when cut.

3. After death the lungs and bronchioles are found filled with a frothy liquid. If the animal is stabbed just before death, or if the animal dies a natural death the blood collects in the deepest lying part of the lungs, which parts are moist, dark red in color, and uniformly filled with blood.

4. However if, in stabbing the animal the trachea is severed so that the blood cannot escape from the lungs, then the lungs are likewise colored red, but not so uniformly, some lobules being discolored while others lying between remain normal and retain the rose red color. In this case the bloody froth is always present in the lungs.

LUNGS AND LIVER OF CATTLE.

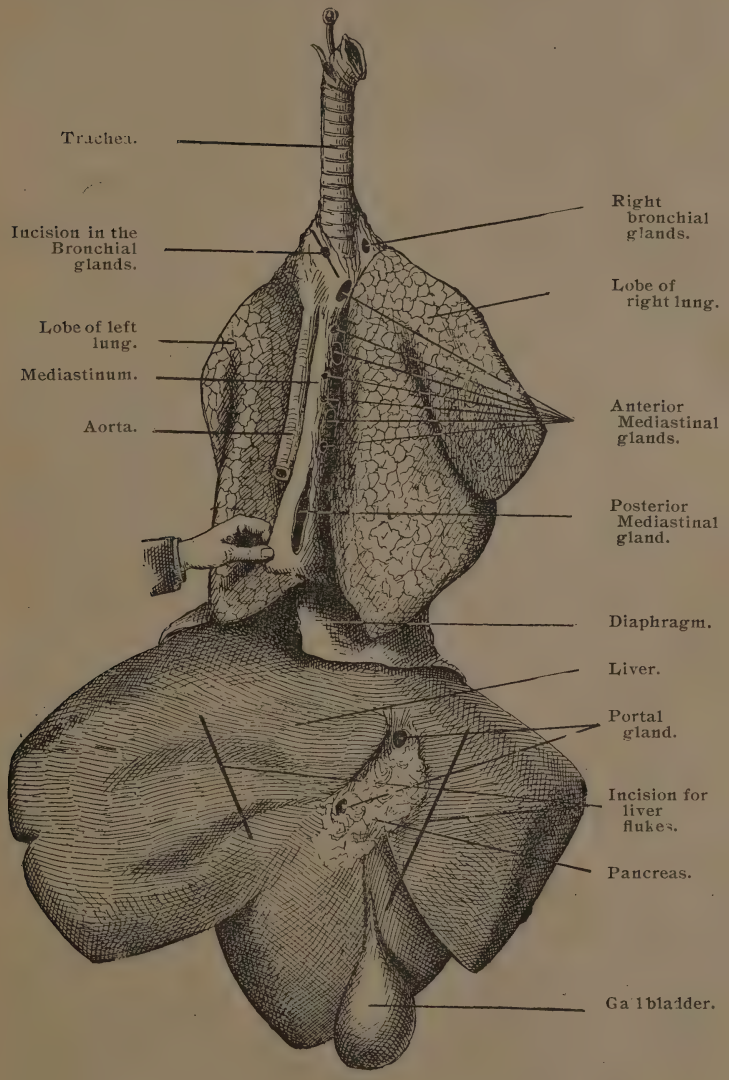


FIG. 2.

5. If water is forced into the lungs before death, rose-red lobules appear alternately with grayish-red, almost jelly-like lobules, and in the bronchioles as well as in the trachea are found large bubbles of froth. If the water is forced in just after death, for example in washing, the entire lung is very heavy, feels like jelly to the touch and appears uniformly grayish-red and glassy.

6. In killing the animal the contents of the stomach may be forced into the lungs, causing him to vomit the stuff either through the nasal chambers or through the severed trachea and gullet direct into the trachea and lungs. Such lungs usually appear dirty at the point of bifurcation of the trachea, and even the lungs may themselves appear so. Exact surety as to how far the stomach contents have been forced in, is obtained by cutting into the lungs. The author has never seen stomach contents in the lungs of swine.

Conclusions: All these conditions give no occasions for doubts. Such lungs are used for the market after the apices are removed to allow the contents to flow out. The greatest disadvantage they have is that they spoil more easily.

The presence of food in the lungs excludes them from the market only when the food has been forced into the bronchioles. If, however, it is present only in the trachea and its main branches, the contents are removed and the lung passed.

Regarding the future entrance of air into the lungs, see Bloated flesh.

(b) The PERICARDIUM surrounds the heart completely like a sac. It is bounded above by large vessels, below by the sternum and is transformed into the mediastinum. In well nourished animals it has a rather thick layer of fat. The inner surface is smooth, shining and damp. Within the pericardium is contained a limited amount of a clear, bright-yellow liquid.

(c) The HEART is brownish-red in color, shining and

rather solid. On the inside it is lined by the serous endocardium which lead from the walls of the chambers and valves. (See figure 1). The auricles have appendices which are yellowish to a grayish-red color. The inner and outer surfaces of the heart are covered with a membrane which possesses the same characters as the inner surface of the pericardium. The serous endocardium is reddened more deeply than the depression.

At the point where the aorta starts from the left ventricle are two bones in cattle, which in other animals are cartilagenous, although in old swine they may ossify.

The right ventricle is smaller and has thinner walls than the left. In healthy animals that have been slaughtered the right ventricle is flabby and always contains clotted blood, even in those that have been thoroughly bled. The left ventricle is always contracted, feels firm and contains no blood. The left ventricle being flabby and full of blood indicates that the animal was not slaughtered or was sick, and was stabbed either during the death struggle or immediately after death.

The arteries are empty while the veins always contain clotted blood.

(d) The MEDIASTINUM (anterior and posterior) is a fold of the pleura and therefore has the same characters.

The diaphragm, partially cut out with the heart, lungs and liver, is covered on the side toward the lung with the pleura, and on the side toward the liver, with the peritoneum, hence these surfaces have the same characters. In cattle the frequent overgrowth of the diaphragm with the pericardium, as well as the reticulum, is the pathological change. (See page 162.)

(e) The LIVER is covered with the peritoneum (the liver capsule). It has a smooth, shining surface and has a reddish-brown-color, which at first has a bluish glisten. The reddish-brown color predominates in old, not fattened cattle, in poorly

nourished sheep, and in most swine. In calves, well nourished and young cattle, sheep and swine, the color is yellowish-brown, which changes to reddish-brown under the influence of air. Reddish-brown livers are more firm, and their edges are sharper than the yellow-brown ones, which are soft and have rounded edges. Shortly after digestion, either the entire liver or separate parts have the latter characteristics (see page 24). Fat livers have a greater weight, and the capsule is more dense. Animals that are imperfectly bled have a darker, softer liver, which is filled with blood.

The lymphatic glands of the liver lie on the posterior surface, somewhat to the right and below the middle. (See figure 2). Externally their color is mostly gray, which becomes darker and often bluish-black within.

The following characters serve to distinguish the livers of various animals: The liver of the horse is three-lobed and has no gall bladder; the liver of cattle has a gall bladder, is indistinctly divided into two lobes, four cornered, and has a mirror-like surface. In swine besides the two main lobes there are four others. The liver of sheep on the contrary has only two lobes. Upon careful examination of the swine liver the division into lobules is very easily distinguished, which is not the case with calf liver.

The calf liver is most valuable. The swine liver is used for manufacture of sausage, but is often submitted for calf liver.

(f) The PANCREAS is grayish-yellow or grayish-red in color, is firm and has the structure of a cluster of grapes. In cutting up cattle for beef, part of it adheres to the liver, part to the paunch and part to the duodenum.

4. THE HEAD.

(a) MOUTH AND THROAT CAVITIES. The mucous membrane of the lips, mouth cavity and tongue is grayish-white, often spotted with black. In swine it becomes loose by scalding, and is easily removed (See page 123). The mu-

eous membrane of the throat cavity is dark, slippery, being covered with mucous, and is often contaminated with the stomach contents. The mucous membrane of the larynx, trachea and gullet is white, that of the latter being laid in folds. The tonsils are located between the soft palate and the base of the tongue. They are yellowish-white in color and rather firm to the touch. The salivary glands (parotid, summaxillary and sublingual) have the structure as the pancreatic gland, but are of a brighter, more rose-red color. The thyroid gland is situated just beneath the larynx, upon the trachea. It has a brown color, is firm, and has two lateral parts and a middle part.

(b) The TONGUE immediately after the animal is slaughtered, is long and soft; after a short time it contracts and becomes more firm. Upon feeling through it no hardened spots are found.

(c) The NASAL CAVITY is of great significance only in horses, on account of glanders. The mucous lining is smooth and shining, and is colored rose-red. In order to examine the nasal cavity it is necessary to saw open the head lengthwise a trifle to the side of the median line.

(d) The CRANIAL CAVITY, as a rule, is opened only in horses and swine. It is lined with the hard cerebral membrane, and encloses the brain, which is white on the surface and gray within. The brain is covered with the soft cerebral membrane (Pia mater).

The lymphatic glands encountered in making an examination of the head are as follows:

1. The submaxillary glands lie in the maxillary space (See Fig. 3) and take up the lymph from the lower cranium (nose, cheeks, lips and tongue).

2. The posterior pharyngeal glands lie in the rear wall of the throat cavity (See Fig. 3). They are easiest found by drawing the tongue down with the left hand, and making a cross cut through the throat with the right hand. These glands take

HEAD OF CATTLE.

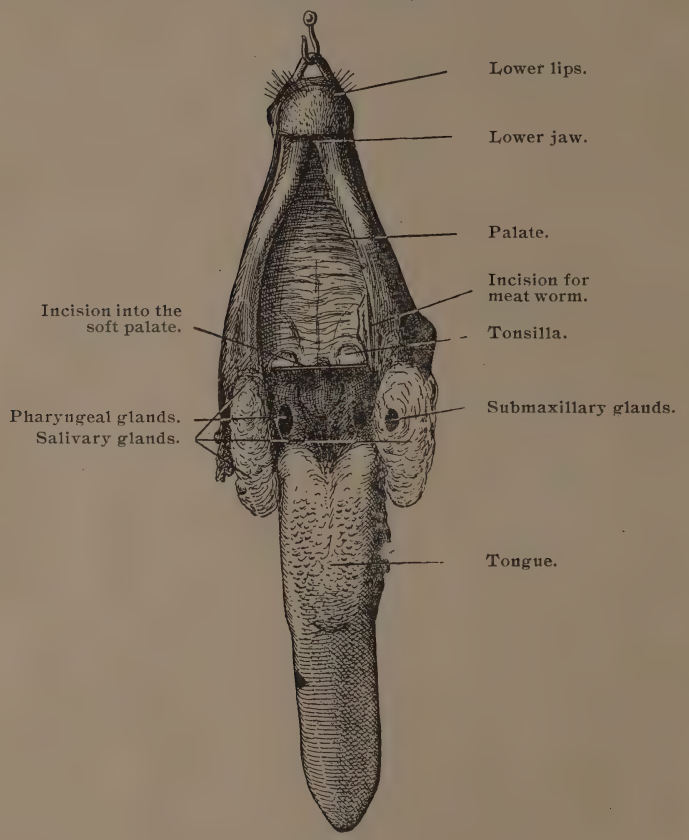


FIG. 3.

The following characters distinguish the tongues of the various animals: The tongue of the ox has a firm, somewhat enlarged posteriorly and is provided with sharp, horny spines. The tongue of the sheep and goat likewise has this enlarged, but the spines are lacking. The ruminants have upon each side of the tongue 13-16 pappilli, while the other animals have only two. In swine the anterior end of the tongue is more pointed and has a sharp edge; in calves it is more rounded. In sheep and goats there is a furrow along the median line.

up the lymph from the other glands of the head and hence exert an influence over the character of the entire head, excepting the nose and mouth, whose characters are influenced by the submaxillary glands (especially in the horse). The posterior pharyngeal glands and the superior jugular glands lie very close to one another, and are difficult to distinguish, excepting in cattle.

3. The lymphatic glands of the ear region lie inward from the parotid gland, behind the maxillary joint. They take up the lymph from the lateral part of the head.

4. The superior jugular glands lie at the posterior wall of the larynx, in the vicinity of the thyroid gland.

5. THE REMAINING VISCERA.

The INTESTINAL CANAL is covered with the peritoneum which is gray, smooth and shining. The mucous membrane of the stomach (of the fourth stomach in ruminants) is reddish-gray, rather thick and lies in moderately strong folds. The mucous membrane of the small intestine is more red; that of the large intestine on the other hand is more gray, and lies in folds.

The four stomach divisions of the ruminants have the following characters:

The mucous membrane of the rumen is firm and has a white to a yellowish-white, often grayish-black, or black color and has a villous coat. The reticulum is divided by a ridge of mucous membrane which looks like a honey comb and which is arranged reticularly. The omasum has separate folds, which extend from the outer wall to the center, and are of different sizes. The gullet ends between the abomasum and the reticulum. In grown animals the rumen is the largest, the abomasum next. In cattle the reticulum, and in sheep the omasum is the smallest division. The rumen is divided into two sacs, the reticulum is hood-shaped, the omasum round, and the abomasum elongated. The omasum is nearly full, the rumen

TONGUE AND LARYNX OF SWINE.

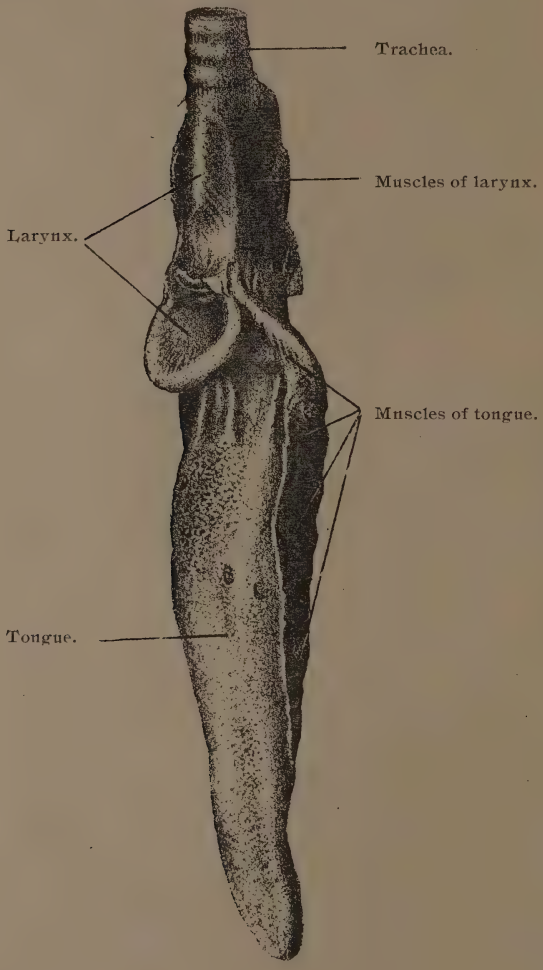


FIG. 4.

moderately so, the reticulum empty and the abomasum feels slimy; in the reticulum one can feel through to the net-work.

The various intestinal parts show the following characters:

In cattle: The small intestine lies in the mesentry, is irregular, and one side is free from fat. The large intestine lies completely embedded in fat and is almost entirely smooth. The ilium is completely embedded in fat and feels thick. The duodenum, on the contrary, is not embedded in fat, feels thin, and as a rule a portion of the pancreas adheres to it. The colon lies in double folds like a disk, surrounded on both sides by fat. The caecum is enclosed by fat only on one side in which layer of fat the ilium also runs.

In sheep the relation is the same as in cattle. In swine the various parts are differentiated by means of their color. The stomach is grayish-white, the small intestine grayish-red and the large intestine bluish-gray. The stomach is smooth. The caecum has three rows of folds. The jejunum hangs in the mesentery. The colon is a screw-like double fold.

In horses the small intestine hangs in a long mesentery. The colon lies in two layers, which are joined together by means of a short mesentery. The upper layers are smooth while the lower layers have broad folds. The caecum is easily distinguished by the pointed blind end.

The lymphatic glands of the stomach, in swine, lie in the small curve and beneath the pancreas. In ruminants they lie in the furrow of the rumen between the second and fourth stomachs, at the end of the fourth stomach, and at the second stomach. The lymphatic glands of the intestines lie in the mesentery close to the intestines. In swine and cattle they form an endless chain of glands. In swine there is a second chain of glands at the upper end of the mesentery (at its origin).

(b) The spleen is firm but tender, mostly smooth, has a sharp border and in section shows a distinct framework which is filled with a non-flowing, brownish-red substance permeated

with granules. The spleen increases in size shortly after food has been taken. It should be especially noted here that aside from the union by means of the peritoneum, the spleen is joined to the intestines and liver not directly, nor by means of the lymph vessels or portal circulation, but only by means of the great blood system. (Important in the diagnosis of tuberculosis, See Tuberculosis.

The lymphatic glands of the spleen are very small. They lie in the peritoneal fold between the spleen and the stomach. Their color is reddish-gray to blackish-gray.

In the different species of animals the spleen has different shape and color. In the horse it is flat, scythe shaped, steel-blue in color, which later becomes reddish-brown.

In cattle it is longitudinally oval and flat. Its color is reddish-brown in young fat animals, and more blue, later grayish-blue in those not fat. In fat animals the border is not so sharp. In many cattle which are fed upon pasture lands the spleen is dark brown to black on the exterior surface, and especially so upon the cut surface. The border is sharp, and the texture firm. (Important in the diagnosis of anthrax).

In calves the spleen is grayish-red, later more brownish-red.

In sheep and goats it is almost circular, some spleens having a flat surface, others arched. The color is reddish-brown, later becoming more red.

In swine the spleen is long and narrow, feels flabby, and is bright red in color, later brownish red.

(c)The OMENTUM AND MESENTERY are folds of the peritoneum, and hence have smooth, shining surfaces. According to the nourished condition of the animal they contain more or less fat, which is uniformly distributed in the mesentery; in the omentum on the contrary it is laid like a net. Besides the fat there are found blood and lymph vessels, nerves and lymphatic glands. In well-bled animals no blood is found in the blood vessels. On the other hand, in swine the

blood vessels directly over the intestine are always filled with blood. Hence at this place the mesentery is closely striped with red.

In the mesentery of swine, close to the intestine there are found, but only in rare cases, small blisters differing in size from that of a pinhead to a hazel nut. These are filled with gas, and crackle upon pressure. In meat inspection these have no significance.

(d) MALE SEXUAL ORGANS. The male sexual organs (penis, prepuce, scrotum, testicles, with the different accessory glands) are of secondary importance in meat inspection. In bulls, steers, rams and wethers the S shaped curve of the penis predominates, which may cause a retention of the urine. This condition is also unimportant so long as no change takes place in the other organs. (See Retention of Urine).

(e) FEMALE SEXUAL ORGANS. The female sexual organs are very important in meat inspection, because diseases resulting from parturition injuriously affect the condition of the meat.

The uterus consists of a middle part (the body), and two horns. Posteriorly the body ends at the vagina; anteriorly it extends into the horns which are suspended by the broad ligaments. In animals that have not been pregnant, the womb is small and narrow, while in animals that have been pregnant it is larger and the horns are ruffled, so that at first sight they may easily be confused with the loops of the small intestine. This confusion may be avoided by careful examination, which will show that one end is attached to the ovary and the other leads into the body of the uterus. The uterus is covered with the peritoneum and hence has a smooth, shining anterior surface. The broad ligaments are folds of the peritoneum. The muscular coat of the uterus is very strongly developed. The mucous membrane is laid in longitudinal folds, is covered with a stringy mucous, and has a dirty grayish-red color.

During pregnancy the mucous membrane forms villi, which

join with the villi of the chorion, a sac in which the young lies. In the horse these villi form on the entire chorion, in swine only on the middle part, and in ruminants in separate parts in the form of the so-called cotyledons. These cotyledons may be separated from their attachments, the villi being drawn out like the finger from the glove. Those remaining on the chorion are more red, while those adhering to the uterine mucous membrane are colored more yellowish. At the time of parturition the chorion with its villi comes out, while the villi of the uterine mucous membrane remain attached, degenerate in size to that of a pea, which are easily distinguished by their yellowish color. Eight to ten days after parturition, and in isolated cases even later, the dead portions of the mucous membrane come off and pass through the vagina. At this time the mucous membrane is very red, covered with glassy, not bad-smelling mucous interspersed with dark red, later with white or whitish-yellow clots. About four weeks after parturition the uterus has completely contracted, but remains larger than before pregnancy, and the mucous membrane lies in folds.

The ovaries lie at the end of the horns of the uterus in the folds of the broad ligaments, in which are found also the fallo- the folds of broad ligaments, in which are found also the fallopian tubes. The ovaries have a round or bean-shaped form and are nodular in structure; in swine, almost like a cluster of grapes. Upon the surface as well as within are found small follicles filled with a bright fluid, in which are found the female ova, and also the yellow scars caused by the bursted follicles. The ovaries are not covered with the peritoneum, and hence do not possess the smooth shining surface.

The vagina is a membranous canal beginning with the vulva and ending with the neck of the uterus. The mucous membrane is almost white, rather tough and laid in strong longitudinal folds. The vulva is made up of two lips. The mucous membrane is rose-red in color, and leading outward it merges into external skin. In the lower part of the vulva lies the

clitoris, which is constructed like the male penis. The lymph vessels of the sexual organs lead into the glands of the udder, pudenda, the lumbar glands and finally into the inguinal glands (see page 52).

(f) URINARY ORGANS. The kidneys lie beneath the last dorsal and first lumbar vertebrae, outside of the peritoneum. They are always surrounded by a fatty coat, which is more or less highly developed according to the nourished condition of the animal. In general they have a longitudinal oval or bean shaped, flat form, are smooth, shining, and covered with a rather firm, smooth, transparent membrane, which is easily removed. Their color is reddish-brown, permeated with countless red points. The kidneys of the calf are almost black immediately after birth; later they become dark red; after three weeks they become yellowish-red, and then turn to a reddish-brown.

The lymphatic glands of the kidneys lie at the point of attachment, between the uterus and the blood vessels. The glands are very easily found by making a cut between the kidney and the aorta at the point where the renal artery leads from the latter. They are colored a rather dark red. (See figure 5.)

The cut surface of the kidney is uniformly smooth and shining, and shows three layers, the enveloping tunic, the cortical layer and the medullary layer. The enveloping tunic has the characters of the surface, the cortical layer is red, the medullary bright yellow. The entire kidney shows plain striping, which is most plain in the medullary layer and tapers inward into separate points (the uriniferous tubes), which in some animals (the sheep, goat and horse) adhere to form a comb-like structure. The uriniferous tubes end in a membranous sac (the pelvis) into which the urine drops and flows thence through the ureter to the bladder.

The following characters serve to distinguish the kidneys of different animals: In the horse the kidneys are bean shaped (left kidney) and heart shaped (right kidney); in cattle, oval;

in sheep and goats, bean shaped or almost round; in swine, longitudinally oval.

The kidney of cattle and calves consists of 15-35 lobes, which are entirely distinct from one another. Beneath the kidneys are two organs called the supra-renal capsules, which have nothing in common with the kidneys besides their position. Upon the cut surface they show a reddish-brown enveloping tunic and a reddish-yellow medullary layer.

The urinary bladder is covered with the peritoneum only on the anterior portion. The mucous membrane is white or somewhat reddish-yellow, and laid in folds. In very young calves the urachus hangs to the anterior end of the bladder.

(g) UDDER. The udder is designed to give the first nourishment to the newly born animal. Its position is on the abdomen just in front of the hind legs, excepting in swine, in which the separate milk glands (dugs) extend along the whole surface of the abdomen as far as the sternum, five or six on each side. The udder consists of two halves, in cattle four quarters, of which each has a teat. It feels firm to the touch. When severed, milk flows out. The cut surface is reddish-yellow, and if the milk has curdled, yellowish-white flakes are seen, which must not be confused with pus or lesions of tuberculosis.

The lymphatic glands lie above the posterior inner portion of each half of the udder. They are easiest found, in cattle that are hung up, by making a cut in the uppermost part of the udder. (See Fig. 5). In male animals the glands of the pudenda lie in the fat of the scrotum.

(h) PLEURA AND PERITONEUM. At this point the pleura and peritoneum should be mentioned, because the greater part of these two membranes serves to enclose the organs. They are smooth, shining and transparent. In slaughtering they are not separated from the thoracic or abdominal walls, nor from the diaphragm. Yet in the fresh state they are easily torn off. The parts thus deprived appear rough and

LEFT HALF OF COW (INNER SIDE.)

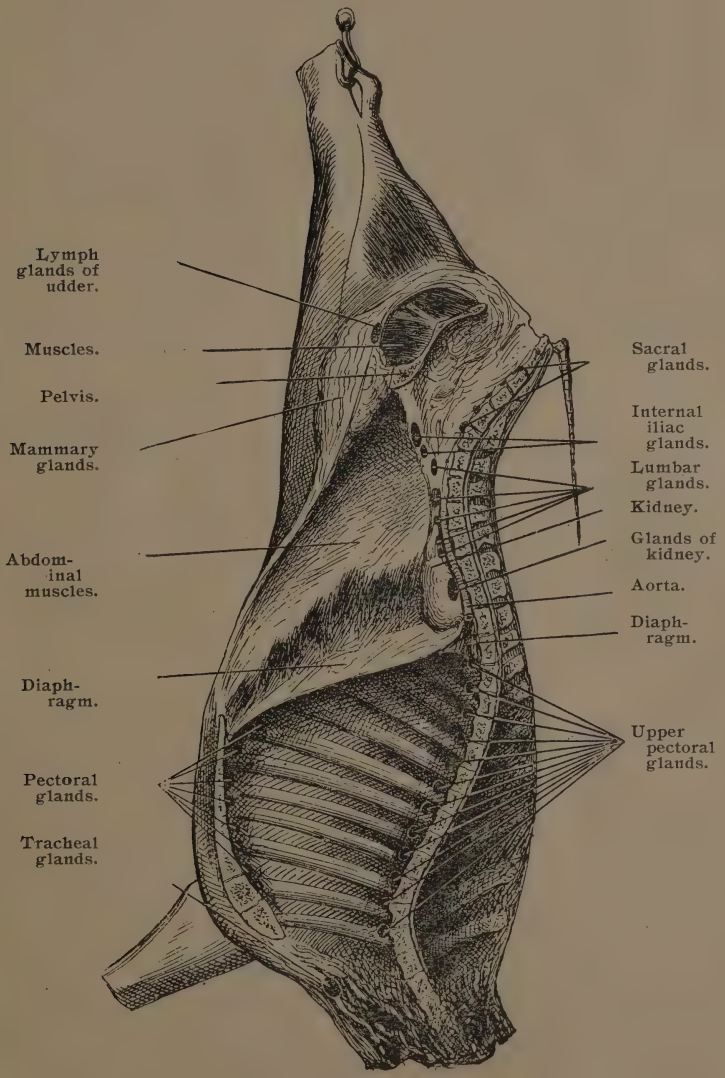


FIG. 5.

are not slimy. In the examination thereof special care is to be taken, as they are often withheld from market to render diseases unrecognizable (especially tuberculosis). The pleura is likewise discarded from cattle in which blood has been forced into the thoracic cavity as a result of an improper stab, thus coloring the pleura red. In calves suffering from peritonitis the peritoneum is also secretly removed.

The following are the lymphatic glands which lie in the chest and abdominal walls. (See Figures 5, 6 and 7).

1. The lymphatic glands of the upper thoracic walls lie between the ribs near the spinal column. Besides taking the lymph from the pleura they also take lymph from the muscles and bones located in that vicinity.

2. The lymphatic glands of the lower thoracic wall lie between the ribs in close proximity to the sternum. They take the lymph from the bones and muscles surrounding them.

3. The lumbal glands lie near the lumbar vertebrae, in similar position to the glands of the upper thoracic wall.

4. The internaliliac glands lie somewhat laterally from the lumbal glands, at the bifurcation of the large blood vessels.

5. The internaliliacae glands lie laterally from the somewhat above (in hanging animals), the latter in the vicinity of the external angle of the thigh bone.

6. The glands of the sacral bone lie in the pelvic cavity near the sacral vertebrae.

7. The external inguinal glands (in cattle) lie outside the pelvic cavity in the external inguinal of the ischium.

The glands mentioned under 3-7 take up the lymph not only from the abdominal cavity, but also from the other parts surrounding them.

Of much more importance are the lymphatic glands which take up the lymph from the muscles, bones and the like. (See Figures 5, 6 and 7).

1. The axillary glands lie on the inner surface of the shoulder

RIGHT HALF OF COW (OUTER SIDE.)

FIG. 6.

blade. In order to find them it is necessary to loosen the foreleg from the body.

2. The superficial cervical glands are in front of the shoulder joint. They are very easily found by making a deep cut in the muscles directly in front of the shoulder joint. (See Figure 6). These glands are very important in the inspection. They obtain the lymph from the forelimbs.

3. The superficial inguinal glands are just as important. They lie in the flank. They are found in cattle by making a cut in the flank, in the hanging carcass, about one centimeter above the limit of the abdominal muscles. (See Figure 6). In swine it is more suitable to make the cut at the point in question, but on the inside. (See Figure 7).

4. The inguinal glands which are very small, lie on the inner side of the leg beneath the pubic bone (in the femoral canal). In female cattle they unite with the lymphatic glands of the udder.

5. The lower jugular glands lie in front of the sternum at the beginning of the chest.

6. The popliteal glands lie in the furrow between the muscles behind the knee joint.

7. In swine there is found a still larger cluster of glands behind and above the hock joint. (See Figure 7).

6. THE FLESH.

By the word "flesh," in the narrow sense is meant the muscles, the bones, fat, vessels, nerves, tendons, cartilages and connective tissue. In the broader sense, the viscera as well as all parts of the animal adapted for human food.

Immediately after being slaughtered the flesh and all the organs have a delicate, shining, almost transparent appearance, which in the various animals is lost more or less suddenly and completely. The blood contained in the flesh indicates whether the animals were bled well, poorly or not at all. In

RIGHT HALF OF SWINE (INNER SIDE.)

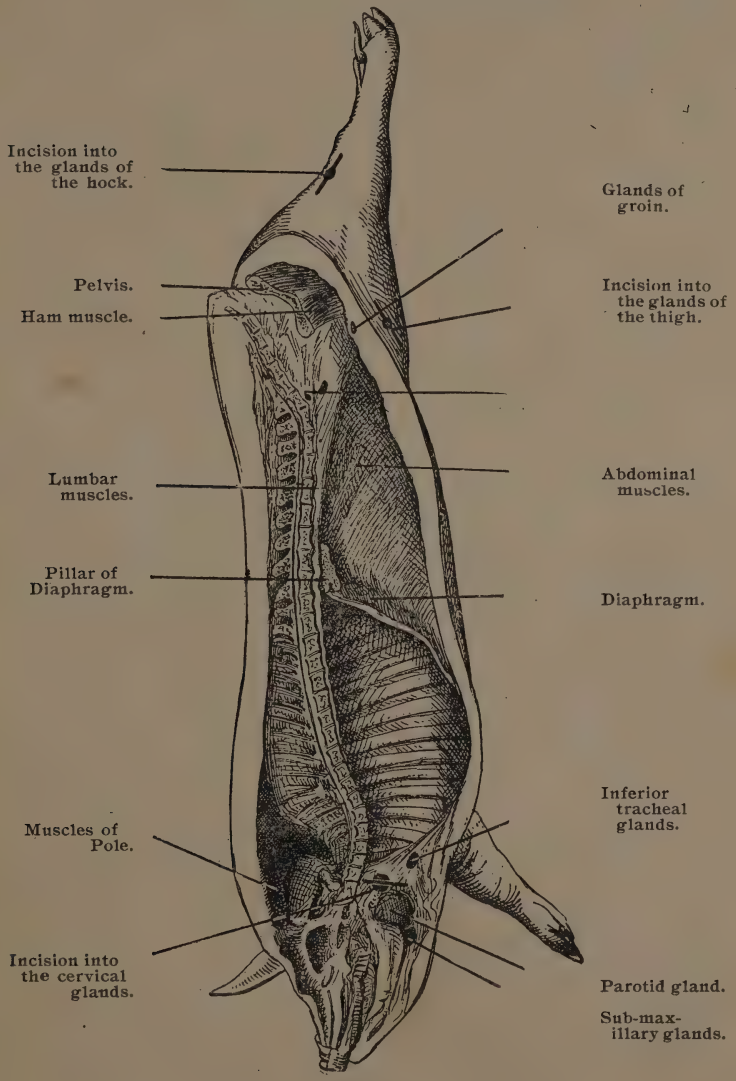


FIG. 7,

general, poorly bled parts are larger, more rounded, darker colored and softer than well bled parts.

(a) In a fresh condition, the muscles are shining, transparent and readily flexible. The muscle, however, soon loses this character, becoming firm, doughy, dull and easily torn. This condition is called "death stiffness" or rigor mortis. This setting of the muscles takes place sooner in fatigued animals than in sound, strong, entirely rested ones. After a time the firmness decreases, the muscles again become softer, but more slippery. In animals in which the rigidity has quickly taken place it is also lost again quickly. Usually the firmness lasts from one to several days. In cool rooms the firmness can be retained for a few weeks (six or more). The longer the muscles retains the stiffness the more tender and palatable becomes the flesh. (The flesh ripens).

The character and the color of the muscles differ according to the age and sex of the animal, not only in the same species, but also in different parts of the same animal. In young animals the muscle fibres are finer and the color brighter than in older animals. In calves and swine the individual muscle groups are a pale rose-red, almost white, in horses and older cattle almost dark red, and in sheep, goats and steers brick-red. The male animals, likewise female animals, have more dark colored muscles, while those of castrated or spayed animals not adapted for breeding purposes show a brighter color. According to the species of the animal the flesh possesses a peculiar odor, which immediately after being slaughtered, and later upon being cooked, becomes stronger and more marked, but which is as a rule not offensive. On the contrary the boar and the billy goat have an offensive odor which permeates the flesh.

(b) The FAT is ragged, granular, dull, white or yellow. In calves up to fourteen days old the fat is gray or reddish-gray, later becomes white and granular. Very young calves and also most old animals have yellowish salty fat. Horses and

pasture animals always have yellow fat; with swine, on the contrary, it is very rarely the case. If the swine are fed on corn, beans or peas, the lard is granular; if fed upon swill and slops it is soft. The lard of swine fed upon fish is gray, not granular, and has the odor of blubber. (See Abnormal Odors).

Fat plays an important part in slaughter house animals, because first it gives an idea as to the nourished condition of the animal, and for another thing serves as a diagnosis in many diseases. Fat meat is more palatable and usually more tender, but in proportion to the mass, lighter than lean meat. The fat is mostly distributed about the kidneys as kidney fat (fatty kidney capsule, especially in calves and cattle), between the peritoneum and the abdominal wall (especially in swine), in the omentum, the mesentery, in the sub-cutaneous tissue either uniformly (large in swine) or in definite points, between the muscles and the liver, and so forth.

In fat animals the kidney capsule is filled tight with fat, the omentum and the mesentery are thick, and more or less thick layers of fat lie upon the different visceral parts (stomach, intestines, pericardium) and also often upon the thoracic and abdominal wall. Rather heavy masses of fat lie in the subcutaneous tissue and between the muscles, as well as along the back and on the sides. The muscles appear fuller and the entire body is more rounded.

In lean animals there is almost no fat upon the back and sides. It is only sparingly deposited between the muscles. The omentum and mesentery contain a very thin layer of fat. The kidneys are only covered sparingly but uniformly. However, the fat is granular and easily becomes stiff.

Very lean animals possess no fat: at the place where fat is found in other animals, viz: the loins. The kidney capsule is sac-like and loose. The omentum and mesentery are transparent membranes. The muscles contain no fat. The animal appears "boney." The skin is hard and cannot be pushed away from the ribs. A fold of the skin taken up in the fingers does not spread out at once when the fingers are removed, but remains folded for a time.

(c) BONES, CARTILAGES, LIGAMENTS AND JOINTS have little significance in meat inspection. In bones there is distinguished red, white, and even yellow marrow. Newly born animals have red marrow, which later is transformed to white or yellow, but which remains red in all flat bones, vertebrae, ribs, pelvis and sternum.

The bone marrow of the sternum and of the ribs is yellow in different places in the middle, and is harder than the other marrow. However, the yellow masses must not be confused with the caseous and calcinated tuberculous masses. In emaciated animals the bone marrow is soft but never liquid.

The cartilages have a smooth surface, are bluish or yellowish-white. The joints have a smooth, shining surface, which is rendered slippery and moist by means of the synovial fluid. The tendons have in some places, i. e., in the limbs, tendon sheaths, which within are supplied with a lubricating fluid the same as the joints.

7. DIFFERENTIATION OF THE FLESH OF VARIOUS ANIMALS.

The stock inspector can discriminate between whole animals or separate quarters without much difficulty; yet it is to be noticed that in the flesh of sheep and goats the goat has longer and slimmer legs, and that the hair always adheres to the surface.

The internal organs are distinguished according to the characters described on pages 33 to 49. Separate parts of the flesh can only be distinguished by an accurate examination of the bones lying next thereto, and by chemical means. The stock inspector is not in a position to do this. Horse flesh will be substituted for beef chiefly, goat flesh for mutton, and dog flesh for pork.

The recognition of the sex in slaughtered animals is not difficult with a little practice.

Bulls have a stout neck and shoulder muscles. The inguinal canal is open. Steers have a highly developed fat neck. Cows are recognized by the udder, and when this is

absent by the lymphatic glands of the udder. In heifers the udder is greatly permeated with fat.

Rams have highly developed muscles. Wethers and rams are recognized by the penis, ewes by the udder.

Billy goats have a strong odor.

A boar is recognized by the skin and odor.

V. RULES AND REGULATIONS FOR THE INSPECTION OF LIVE STOCK AND THEIR PRODUCTS.

U. S. Department of Agriculture,
Office of the Secretary,
Washington, D. C., March 15, 1899.

The following rules and regulations are hereby prescribed for the inspection of live cattle, sheep, hogs, horses, and their carcasses by virtue of the authority conferred upon the Secretary of Agriculture under the provisions of the act of Congress approved March 3, 1891, entitled "An act to provide for the inspection of live cattle, hogs, and the carcasses and products thereof which are the subjects of interstate commerce, and for other purposes," and amendments thereto, approved March 2, 1895, and March 22, 1898, and will supersede all former regulations for the inspection of live stock and their products:

1. Proprietors of slaughterhouses, canning, salting, packing, or rendering establishments engaged in the slaughtering or packing of cattle, sheep, swine, or horses, the carcasses or products of which are to become subjects of interstate or foreign commerce, shall make application to the Secretary of Agriculture for inspection of said animals and their products.

2. The said application must be made in writing, addressed to the Secretary of Agriculture, Washington, D. C., and shall state the location and address of the slaughterhouse or other establishment, the kind of animals slaughtered, the estimated number of animals slaughtered per week, and the character and quantity of the products to go into local, interstate, or foreign commerce from said establishment; and the said ap-

plicant in his application shall agree to conform strictly with all lawful regulations, orders, and instructions that may be made by the Secretary of Agriculture and Chief of the Bureau of Animal Industry for carrying on the work of inspection at such establishment.

3. The Secretary of Agriculture will give such establishment an official number by which all its inspected products shall thereafter be known, and this number shall be used both by the inspectors of the Department of Agriculture and by the owners of said establishment to mark the products of the establishment as hereinafter prescribed.

4. The Secretary of Agriculture will designate an inspector to take charge of the examination and inspection of animals and their products at each establishment which has been officially numbered, and will detail to such inspector, assistant inspectors, or other employes as may be necessary properly to carry on the work of inspection at said establishment. The inspector and all employes under his direction shall have full and free access to all parts of the building or buildings used in the slaughter of animals and the conversion of their carcasses into food products.

(*a*) The Department assumes the right to inspect all animals slaughtered in establishments that have been granted inspection, and no carcasses or meat products which have not been inspected and passed by an officer of this Department shall be allowed to enter such establishment.

(*b*) The managers of abattoirs will inform the inspector in charge or his assistant of the hour upon which slaughtering will commence upon the day following. The inspector or his assistant shall also be informed by the manager when slaughtering has been concluded for the day, and no animals shall be slaughtered at any other hours unless the inspector or his assistant is duly notified.

(*c*) Each employe engaged in inspection under these regulations will be furnished with a numbered badge, which must

be worn in a conspicuous manner while in the performance of his official duties and which must not be allowed to leave his possession.

(*d*) Each employe furnished with a badge must deposit with the inspector in charge a receipt for the said badge and the sum of $2, which amount must be transmitted by New York draft (without expense to the Department), together with the said receipt, to the Chief of Bureau of Animal Industry, and be duly receipted for by the Disbursing Clerk of the Department, who will be the custodian of this guarantee fund. On return of this receipt and badge by the employe at the expiration of his service, the deposit shall be immediately refunded to him.

5. An antemortem examination shall be made of all animals arriving at the stock yards and intended for slaughter at abattoirs at which this Department has established inspection when said animals are weighed, or, if not weighed, this inspection shall be made in the pens. Any animals found to be diseased or unfit for human food, shall be marked by placing in the ear a metal tag bearing "U. S. Condemned" and a serial number. Such condemned animals shall at once be removed by the owners from the pens containing animals which have been inspected and found to be free from disease and fit for human food, and must be disposed of in accordance with the laws, ordinances, and regulations of the state and municipality in which said condemned animals are located.

Animals condemned on account of their pregnant or parturient condition shall not be slaughtered during gestation nor for ten days thereafter. They may, however, be removed by permit for stock and dairying purposes (except when they are affected with or have been exposed to the contagion of any disease) or for rendering into grease.

6. When animals are not inspected in the stock yards the inspector in charge of an establishment, or his assistant, shall carefully inspect all animals in the pens of said establishment about to be slaughtered, and no animal shall be allowed to pass

to the slaughtering room until it has been so inspected. All animals found on either antemortem or postmortem examination to be affected as follows are to be condemned and the carcasses thereof treated as indicated in section 7:

(1) Hog cholera.
(2) Swine plague.
(3) Charbon, or anthrax.
(4) Rabies.
(5) Malignant epizootic catarrh.
(6) Pyaemia and septicaemia.
(7) Mange or scab in advanced stages.
(8) Advanced stages of actinomycosis, or lumpy jaw.
(9) Inflammation of the lungs, intestines, or the peritoneum.
(10) Texas fever.
(11) Extensive or generalized tuberculosis.
(12) Animals in an advanced stage of pregnancy or which have recently given birth to young.
(13) Any disease or injury causing elevation of temperature or affecting the system of the animal to a degree which would make the flesh unfit for human food.

Any organ or part of a carcass which is badly bruised or affected by tuberculosis, actinomycosis, cancer, abscess, suppurating sore, or tapeworm cysts must be condemned.

(14) Animals too young and immature to produce wholesome meat.
(15) Animals too emaciated and anaemic to produce wholesome meat.
(16) Distemper, glanders and farcy, and other malignant disorders, acute inflammatory lameness, and extensive fistula.

7. The inspector or his assistant shall carefully inspect at the time of slaughter all animals slaughtered at said establishment and make a postmortem report of the same to the Department. The head, tail, caul, or fat inclosed in the omentum of the animal, and all other portions of which are to be used as food

products, shall be retained in such manner as to preserve their identity until after the postmortem inspection has been completed, in order that it may be identified in case of condemnation of the carcass. Should the carcass of any animal on said postmortem examination be found to be diseased or otherwise unfit for human food, the said carcass shall be marked with the yellow condemnation tag, to be attached with wire and seal, and the diseased organs or parts thereof, if removed from said carcass, shall immediately be marked with the coupon of the same tag. All unborn calves must be placed in the rendering tank under the inspector's supervision.

All abattoirs at which inspection is established shall provide a suitable room in which condemned carcasses and parts can be held until such a time as the inspector or his assistant can supervise the tanking thereof. Such room shall be arranged for locking with a padlock which will be furnished by this Department, the key to the same to remain in the possession of the inspector or his assistant. The tanking of carcasses and parts will be conducted as follows:

After the lower opening of the tank has been sealed the condemned portions shall be placed in the offal tank in the morning, and immediately a sufficient force of steam be turned into the tank to destroy effectually the meat for food purposes before the killing for the day is completed; or place the condemned portions in the offal tank at the close of the day, or when killing is suspended, and seal both ends of the tank, after which steam shall be turned into the tank until the meat is destroyed; or slash the meat thoroughly with a knife, and then saturate all parts with kerosene and place the portions in the tank. Copper wire and lead seals will be provided by the Department for sealing tanks.

Should the establishment have no facilities for thus destroying the said carcass, it must be removed from the premises by numbered permit from the inspector to rendering works designated by him, and there destroyed under his supervision in the manner described above.

(*a*) Carcasses may be taken to the cooling rooms after marking with the yellow condemnation tag, in cases where only a portion of the carcass is condemned, and when such portion can not be removed without damage to the carcass until it is properly chilled. After chilling, the condemned portions must be cut out and removed to the tank or to the condemned meat room, as provided for whole carcasses. Condemned parts that can be removed without damage to the carcass must be tanked as described above.

(*b*) All condemned carcasses and parts must only be disposed of in the presence of an employe of this Department, and the report of the disposition shall be made by him upon the proper form provided therefor. Condemned tags used to mark the carcasses and parts must not be removed, but must accompany the meat into the tank.

(*c*) Should the owners of such condemned carcasses not consent to the foregoing disposition of them, then the inspectors are directed to attach to carcasses or parts a condemned tag by means of a wire and lead seal. This seal shall have the word "Condemned" impressed upon the one side and the letters "U. S. A." upon the reverse side, also brand the word "Condemned" upon each side and quarter or piece of said carcass, and a record kept of the kind and weight of the carcasses, and they shall, under supervision of the inspector or his assistant, be removed from the abattoir; and said firm or corporation shall forward, through the inspector, to the Secretary of Agriculture, a sworn statement monthly giving in detail the disposition of the carcasses so condemned and, if the same have been sold, showing to whom, whether for consumption as food or otherwise, with what knowledge, if any, by the purchasers, of the condemnation by this Department, and whether or not before such sale said carcasses have been cooked or their condition at the time of inspection by this Department, altered, and, if so, in what way.

The inspectors shall, when authorized by the Secretary of

Agriculture, give notice by publication to the express companies and common carriers at the place of condemnation of the fact of condemnation, giving the name of the owner of such carcasses or parts, the time and place of slaughter, the reason for rejection, and a description of the carcasses or parts, and warning them not to transport them out of the State.

8. All persons are warned against removing the tags, seals, or brands so attached to condemned carcasses or parts, and are notified that they will be prosecuted under the act of Congress of March 3, 1891, and March 2, 1895, for any such attempt to tamper with the device for marking condemned carcasses or parts of carcasses as prescribed by the preceding regulation.

9. Carcasses or parts of carcasses which leave said establishment for local, interstate, or export trade will be marked by the inspector, or an employe designated by him, with a numbered tag or a branding stamp, issued by the Department of Agriculture for this purpose, and a record of the same will be sent to the Department at Washington.

(*a*) Carcasses or parts of carcasses which go into the cutting room of an abattoir or are used for canning purposes must not be tagged. Those which are to be shipped from one abattoir to another for canning or for other purposes must not be tagged; and the inspector in charge of the abattoir to which the shipment is consigned, in cars sealed and tagged on both sides, must be notified of the said shipment, including the number and initials of the said cars and the routes traversed by them. Cars which contain other than inspected meat must not be sealed.

Managers of abattoirs must give due notice to the inspector or his assistant of all intended shipments and of all expected receipts of meat in cars, if the meat is received to be taken into an abattoir having inspection, and the seals upon said cars shall not be broken except in the presence of an inspector.

No meat or meat products shall be received at an official

establishment unless the inspector or his assistant has full knowledge concerning the same.

10. Each article of food product, whether in cans, barrels, firkins, kits, boxes, or canvas, made from inspected carcasses, must bear a label containing the official number of the establishment from which said product came, and also contain a statement that the same has been inspected under the provisions of the act or acts pertaining thereto.

(*a*) A copy of said label must be filed at the Department of Agriculture, Washington, D. C., and after filing said label will become the mark of identification showing that the products to which it has been attached have been inspected, as provided by these rules and regulations; and any person who shall forge, counterfeit, alter, or deface said label will be prosecuted under the penalty clause of section 4 of the act of March 3, 1891, as amended in the act of March 2, 1895.

(*b*) All packages, such as barrels, boxes, firkins, kegs, etc., to be shipped from the said establishment to any foreign country must have printed or stenciled on the side or on the top by the packer or exporter the following:

FOR EXPORT.

(*a*) Official number of establishment.
(*b*) Number of pieces or pounds.
(*c*) Shipping marks.
(*d*) Inspected according to act of Congress .....*

In case said package is for transportation to some other State or Territory, or to the District of Columbia, in place of the words "For export" the words "Interstate trade" shall be substituted.

(*c*) The letters and figures in the above print shall be of the following dimensions: The letters in the words "For export" or the words "Interstate trade" shall not be less than three-

*In the blank space following the word "Congress" the date of the act under which the inspection is made shall be inserted.

fourths of an inch in length and the other letters and figures not less than one-half inch in length. On packages too small to contain the words of the dimensions given, smaller letters may be used. The letters and figures affixed to said package shall be black and legible, and shall be in such proportion as the inspector of the Department of Agriculture may designate.

11. The inspector of the Department of Agriculture in charge of said establishment, being satisfied that the articles in said packages came from inspected animals, and that they are wholesome, sound, and fit for human food, shall cause to be pasted upon said packages meat-inspection stamps bearing serial numbers.

12. In order that the stamps may be protected, and to insure uniformity in affixing, inspectors will require of the proprietors of abattoirs and packing establishments the adoption of cases suitable for one of the two methods mentioned below:

(*a*) The stamp may be affixed in a grooved space let into the box, of sufficient size to admit it, similar to that required by the Internal Revenue Bureau for the stamping of packages of plug tobacco.

(*b*) Stamps may be placed on either end of the package, provided that the sides are made to project at least one-eighth of an inch to afford the necessary protection from abrasion.

13. The stamp having been affixed it must be immediately canceled. For this purpose the inspector will use a rubber stamp having five parallel waved lines. At the top of said rubber stamp shall be the name of the inspector and at the bottom the abattoir number. The imprinting from this rubber stamp must be with durable ink over and across the stamp and in such a manner as not to make the reading matter of the stamp illegible. The stamp having been affixed and canceled it must be immediately covered with a coating of transparent varnish or other similar substance. Orders for inspection stamps and for rubber canceling stamps must be made by the inspector or the Chief of the Bureau of Animal Industry.

14. No stamps, tags, seals, etc., will be issued by the inspector except to employes of this Department designated by him to supervise the affixing of said stamps, etc., to inspected products, and each employe having charge of this work shall be held personally responsible for the stamps, tags, seals, presses, etc., issued to him, and shall make an accurate daily report to the inspector of the use of such stamps, etc., and all unused articles shall be turned over to the custody of the said inspector or of his clerk at the close of each day's work.

(*a*) Proprietors of abattoirs will supply all the necessary help to affix the stamps, which must be done under the supervision of an employe of this Department.

(*b*) No stamps, tags, etc., shall be allowed to remain loose about the office or the abattoirs, and inspectors are instructed to use such additional safeguards as in their judgment will be necessary properly to account for every stamp, tag, etc., issued by them, and to have the work of affixing so carefully supervised that nothing but inspected products will be so marked.

(*c*) Any stamps, tags, or seals damaged or not used should not appear upon the reports as having been affixed to inspected articles, but should be returned to the inspector in charge and a report made as to the reasons for their return.

Certificates of inspection which are not used or otherwise rendered useless must be returned to the Department at Washington.

15. Whenever any package of meat products bearing the inspection stamp shall have been opened and its contents removed for sale, the stamp on said package must be obliterated. Tags removed from inspected carcasses and parts must be destroyed.

16. Reports of work of inspection carried on in every establishment shall be daily forwarded to the Department by the inspector in charge on such blank forms and in such manner as will be specified by the Chief of the Bureau of Animal Industry.

17. Whenever an abattoir suspends slaughtering operations the inspector in charge will promptly furlough without pay, until further orders, all employes whose duties are affected by such suspension, notifying this office of the same. During said suspension he will retain only such employes as are actually necessary to supervise the shipments of inspected products from said abattoir.

18. The inspector in charge of the slaughtering or other establishment will issue a certificate of inspection for all carcasses of animals or the food products thereof which are to be exported to foreign countries, which certificate will cite the name of the shipper, the date upon which the stamps were affixed to packages, or tags to cars, the name of the consignee, and destination. Packages should not be stamped until they are ready for shipment. Said certificate will also contain the numbers of the stamps or tags attached to the articles to be exported, and the shipping marks, and will be issued in serial numbers and in triplicate form. One certificate only will be issued for each consignment, unless otherwise directed by the Chief of the Bureau of Animal Industry.

Both the original and duplicate certificates must be delivered to the exporter. The original is to be attached by him to the bill of lading accompanying the shipment for the information of the custom authorities, and should be delivered to the chief officer of the vessel upon which said consignment is to be transported and continue with the shipment to destination. The duplicate should be forwarded by the consignor to the consignee, to be used by the latter in identifying the shipment at the port of destination by comparison with the original.

(*a*) All names, marks, stamp numbers, imprints, and other writing of any description made upon the certificate of inspection must be copied on the stub of the book of certificates and be duly signed by the inspector. This stub constitutes the third copy of the certificate, and shall be preserved and forwarded to this Department.

19. All packages, such as cans, barrels, boxes, kits, firkins, etc., containing inspected horse meat must be so marked as to indicate the species of animal from which made. Special stamps and certificates shall be used in marking and in certifying to inspected horse meat. No other animals are to be slaughtered or certified to in an establishment engaged in the slaughter or packing of horse flesh.

MICROSCOPIC.

20. A microscopic examination for trichinae must be made of all swine products exported to countries requiring such examination.

(*a*) No microscopic examination will be made of hogs slaughtered for interstate trade, this examination will be confined to those intended for export trade, and only at abattoirs which export pork products to countries requiring a certificate from this Government to secure the admission of such meats. All inspectors issuing certificates for export of swine products which have been microscopically examined will enter upon the same the number of each stamp used, also the name of the consignor, consignee, destination, and description of article.

(*b*) The purple meat-inspection stamp and certificate will be used only for packages containing products of hog carcasses which have been microscopically examined for shipment to countries requiring such examination.

All stamps upon packages containing microscopically inspected meat must be placed in grooved spaces as provided by paragraph (*a*), section 12, and covered with tin. Stamps upon barrels need not be placed in grooved spaces, providing tins having raised centers, one-eighth of an inch high, the size of stamps, are used. The tins placed over stamps must be sufficiently large to go over the whole.

All stamps upon other packages shall be arranged as provided by section 12.

21. The microscopic inspection of pork intended for export

to countries requiring such inspection shall be conducted as follows:

When the slaughtered hog is passed into the cooling room of said establishment, the inspector in charge, or his assistant, will take from each carcass three samples of muscle—one from the pillar of the diaphragm, one from the psoas muscle, and the other from the inner aspect of the shoulder, and also from the base of the tongue when that organ is retained for exportation; and said samples will be placed in small tin boxes, and a numbered tag will be placed upon the carcass from which said samples have been taken, and a duplicate of said tag will be placed in the box with said samples. The small boxes will be placed in a large tin box provided with a lock. The boxes containing the samples from the hogs in the cooling room so tagged will be taken to the microscopist for such establishment, who shall thereupon cause a microscopic examination of the contents of each box containing samples to be made, and shall furnish a written report to the inspector giving the result of said microscopic examination, together with the numbers of all carcasses affected with trichinae.

The samples of pork microscopically examined shall be classified as follows:

Class A.—Samples in which there are no signs of trichinae, living or dead, calcified cysts, or other bodies or substances having any resemblance to trichinae or trichinae cysts.

Class B.—Samples in which there are disintegrated trichinae or trichinae cysts, calcified trichinae or trichinae cysts, or bodies having any resemblance thereto.

Class C.—Samples in which there are living or dead trichinae bodies not disintegrated.

22. All carcasses reported by the microscopist to the inspector as affected with trichinae (Class C) shall be removed from the cooling room of said establishment under the supervision of said inspector or that of some other reliable employe of the Department of Agriculture, and shall be disposed of in accord-

ance with the provisions of section 7, or they may be rendered into edible lard at a temperature of not less than 150 degrees Fahrenheit, or made into cooked meat products if the temperature is raised to the boiling point a sufficient time to thoroughly cook the interior of the pieces.

Carcasses belonging to Class B shall be rejected for shipment to countries requiring microscopic inspection. All meat belonging to Class C and which is to be cured before being cooked shall be marked with twine and seals provided for that purpose.

23. Separate cellars must be provided in which microscopically inspected meat must be cured and stored, and no other meats are to be allowed therein. These cellars must be so arranged that they can be securely locked, and the key must remain in the possession of a trusted employe of the Department, who must lock and unlock the cellar as the business requires. He must also keep an exact account of all meats going into and from the cellar.

(*a*) Before the cutting up of microscopically inspected carcasses is commenced, all carcasses which have been either condemned or rejected must be removed from the rail upon which the passed carcasses are hanging, and after the passed carcasses have been cut up and disposed of the condemned and rejected ones must be disposed of in accordance with these regulations.

The cutting up of carcasses which have been passed must be done under the personal supervision of an employe of the Department. Before the cutting is commenced, all benches, chutes, etc., must be cleaned of all other meats. When it is finished a stop must be made to clear away all meats before the cutting of other hogs is begun.

(*b*) The greatest diligence must be exercised at abattoirs where sausage, brawn, and other products of a similar nature are prepared from microscopically inspected meat and the same are handled. Such sausage must be kept in separate compart-

ments, provided with locks, the same as other microscopic meats, and must also be prepared in separate rooms and cut up in choppers used only for such sausage. An absolutely correct record must be kept, by weight, of all such meats, in order to prevent any but passed products being used.

(*c*) Whenever it is necessary to remove hams, shoulders, sausage, or other microscopically inspected meats from their respective compartments for smoking or other preparation, a separate smokehouse or compartment must be provided, or each piece must be marked by seals affixed by an employe of this Department.

24. At all cities where inspection is established inspectors are requested to notify the municipal authorities of the character of the inspection and to co-operate with them in preventing the entry of condemned animals or their products into the local market.

JAMES WILSON,
Secretary of Agriculture.

VI. GENERAL INSTRUCTIONS TO INSPECTORS AND OTHER EMPLOYES OF THE BUREAU OF ANIMAL INDUSTRY.

1. All official correspondence from employes of the Bureau who are not in Washington should be addressed to the Chief of the Bureau of Animal Industry, and in all instances where a number appears upon official correspondence from this office pertaining to the same subject, the reply should contain a reference to said number. Inclose all letters in the regular official envelopes. No names of persons connected with the Bureau in any capacity are to be written or stamped on the envelopes containing such official correspondence, but the word "communication" shall be written or stamped (if not already printed) under the words "Bureau of Animal Industry" as they appear upon the outside of the envelope.

(*a*) No semiofficial or private correspondence in regard to the business of the Bureau is to be conducted by any officer of the Bureau stationed outside of the city of Washington. All correspondence on these matters is to be official and must be addressed as above directed.

(*b*) Write only upon one side of the paper, and include only one subject in each letter, but several letters may be inclosed in one envelope.

Fold each letter into three equal parts, from bottom to top. After being folded you will write your name upon the back of the portion containing the printed letter head two inches from the top or edge. Underneath name write, respectively, place, date of writing, and brief of contents.

(*c*) Your attention is directed to order No. 463 of the Post-Office Department, page 43 of the Fiscal Regulations of this Department. In order that there may not be unnecessary expenditure in the transmission of telegrams, you are directed to register your name and official address with the telegraph company or companies of your city. After doing so you will immediately notify this office, for hereafter only your surname and city will be included in your address. When forwarding messages to this office you will direct "Animal Industry, Washington, D. C.," affixing your surname only. No superfluous words or figures shall be used in composing telegrams, and so far as practicable figures should be spelled.

(*d*) Always immediately notify this office whenever there are any changes in the firm names of the establishments under your charge.

2. Each clerk or other employe shall initial in the upper left-hand corner all reports made out by him unless the same bears his signature. Errors occurring in such reports will be recorded in the file jacket of the person responsible therefor.

(*a*) Reports concerning routine work must not be inclosed in the same envelope with special reports or communications. No report should be inclosed within another report, although

several may be forwarded within the same envelope, but slips should be inclosed within the report to which they pertain.

(*b*) The date of the M. I. 18 report should in all cases be the same as that of the certificates reported thereon.

(*c*) *No erasions or alterations* shall be made upon a certificate. In case of clerical or other error made in filling out a certificate, such certificate must be marked "Canceled," and returned to this office, the number of the certificate and the reason for cancellation being entered on the M. I. 18 report, and another certificate issued in lieu thereof.

(*d*) A duplicate of an original issue which has been delivered to the shipper may be made only by direction from this office, when good reason is given for such request. The date of such duplicate issue must be that of the original and must be reported on a separate M. I. 18 of like date, stating that it was issued in lieu of certificate No. ——, and giving date of actual issue.

(*e*) The lists containing the numbers of the abattoirs are only for use of employes of this Department. The other forms which do not give abattoir numbers are for distribution to abattoir companies and others who may desire them.

(*f*) The following instructions are to be followed in making your M. I. 10, M. I. 11, M. I. 23, and M. I. 23-C reports:

The number of animals passed and the number condemned must be given as separate items, as indicated on these forms. In order that this may be done accurately, the M. I. 12 and M. I. 13 slips must clearly show the number passed and number condemned. Animals found dead must be reported as item 10 only, and not be included in any other item. The number of these should be given on the M. I. 12, but not included as part of the number condemned before slaughter, which refers only to inspections of live animals. Postmortems on animals rejected in the stock yards and slaughtered at an official abattoir, must not be included with the number of postmortems on the abattoir report; the report of the disposition

of animals rejected in the stock yards must be confined to the reports of the stock yards inspection, and when slaughtered at an official abattoir, the number of such abattoir must be given in connection with the report of the result of the postmortem.

In reporting the quantity of meat received from or shipped to an official establishment, the total weight of the pieces (parts less than quarters of beef or carcasses of hogs, sheep, and calves) must be given, and not the number of such pieces.

When shipments are made to an official establishment the cars must be sealed and tagged on both sides, and the inspector at destination notified. Cars to other places must be sealed as above, unless the contents consist of stamped packages or tagged or branded meat. A full report of the shipments and receipts is to be made on the M. I. 20-A and M. I. 20-C.

3. The receipt of all supplies must be promptly acknowledged to this office upon cards prepared for that purpose. In reporting the receipts of numbered supplies, such as tags, stamps, etc., you will in each case give the numbers of same.

(*a*) Whenever the rubber stamps used for marking meat become so worn as to make an imperfect brand, this office must be immediately notified, and they will be replaced by others. You must frequently examine the stamps and see to it that they are always in good condition and that the impression made is clear and distinct. All imperfect stamps must be returned as soon as they are replaced by new ones.

(*b*) When the scissors used by the assistant microscopists become dull you will forward them to this office to be sharpened, and none of the assistant microscopists or others are to be allowed to attempt to sharpen them. It is not intended that the scissors shall be returned singly, but when a quantity sufficient to justify the shipment shall become dull you will forward them, notifying this office of such shipment.

(*c*) The padlocks which are used for locking the microscopic cellars must be oiled and kept in smooth working condition. Neglect of this precaution has resulted in the breaking of keys and locks in a number of instances.

4. Samples of meats should not be taken from boars, stags, or old sows for microscopic examinations, as such animals should be rejected for this inspection.

(*a*) No one who is not an employe of this Bureau shall be assigned to the work of cutting samples and of affixing stamps to packages containing microscopically inspected product.

(*b*) Microscopic certificates must not be issued for pork unless the same has been handled in the manner indicated and you are certain that the same has been inspected in a careful manner. There must be no opportunity allowed for the addition of uninspected meat to the inspected, or for the shipment of uninspected meat as inspected meat.

(*c*) When microscopically inspected pork can not be kept longer, on account of age or danger of souring, and owing to a lack of orders from abroad, it may be sold for interstate trade. Special attention should, however, be given to determine the necessity for such requests.

(*d*) The stamps and shipping marks must be placed upon the same ends of the boxes. If for any reason it is desired by the shipper to place the shipping mark upon some other part of the box, he may be allowed to do so, but it must also appear with the stamp upon the same end of the box as stated above.

(*e*) Silicate of soda must not be used in affixing purple stamps.

(*f*) Boxes having cleats upon the outside of the ends arrive at destination in much better condition than other boxes. The proprietors of the abattoirs should be requested to make future shipments in such packages. When packages arrive in a broken condition it necessitates the repacking and handling of the meats and affords more or less opportunity for mixing the contents with uninspected meats.

(*g*) In order to prevent the mixing of samples and numbered tags by means of covers of the sample boxes becoming displaced, you will have each layer of sample boxes covered by a thin board fitted accurately to the inside measurement of

the lock box. Boards for this purpose should be obtained without cost from the establishments whose products are inspected. The covers of the sample boxes must be used in addition to the boards.

5. A microscopic examination of pork from this country is required by the following named countries: Germany, France, Denmark, Austria, and Spain. Certificates will not be issued for pork products destinated for export to any of the above named countries unless such meat has been microscopically examined.

(*a*) Reliable information having been received that the Government of Italy no longer requires that pork products imported into that country be accompanied by certificates of microscopic inspection, and that such products are admitted upon simple certification of their healthfulness and that the vise of the Italian consular officer is dispensed with, you may, when requested to do so, certify to pork that has received the regular inspection only, for export to Italy, issuing the white certificates therefor.

(*b*) Whenever microscopic certificates are requested for the shipment of microscopically inspected pork to Finland, the same may be issued in the regular order.

(*c*) You are directed not to issue certificates for, or otherwise certify to, fresh pork for exportation to countries requiring microscopic inspection.

6. Pieces shall be cut from each carcass for examination as follows:

One from the pillar of the diaphragm, one from the psoas muscle, one from the inner aspect of the shoulder, and, when the tongue is removed from the head and attached to the carcass, one from the base of that organ.

Three preparations shall be made from each box of samples, and when samples are obtained from the tongue there shall be four.

The first preparation shall be made from the diaphragm, the second from the psoas, and the third from the shoulder;

when the tongue is retained the second shall be made from it, and third and fourth from the psoas and shoulder, respectively.

Each preparation shall be made and examined separately; when the preparation has been made, the meat must not be placed back into the box containing the other pieces, but must be placed in another box; the other pieces must be handled in the same manner.

Separate glasses and frames must be used for each preparation, in order that they may be retained for re-examination.

7. The samples of pork microscopically examined shall be classified as follows:

Class A.—Samples in which there are no signs of trichinae, living or dead, calcified cysts, or other bodies or substances having any resemblance to trichinae or trichinae cysts.

Class B.—Samples in which there are disintegrated trichinae or trichinae cysts, calcified trichinae or trichinae cysts, or bodies having any resemblance thereto.

Class C.—Samples in which there are living or dead trichinae bodies not disintegrated.

An index figure (1, 2, 3) shall be added to designate the first, second, or third examination or preparation.

The following examinations and classifications shall be made:

Examination of first preparation.

(*a*) All samples in which no signs of class B or Class C are found shall be marked A1 and submitted to a second examination.

(*b*) All samples in which Class B only is found shall be marked B1 and submitted to a second examination.

(*c*) All samples in which Class C is recognizable shall be marked C1 and condemned.

Examination of second preparation.

(*d*) All samples marked A1 in which neither Class B nor Class C are found upon the second examination shall be marked A1, A2, and submitted to a third examination.

(*e*) All samples marked A1 in which Class B only is found upon second examination shall be marked A1, B2, and submitted to a third examination.

(*f*) All samples marked A1 in which Class C is found upon second examination shall be marked A1, C2, and condemned.

(*g*) All samples marked B1 in which neither Class B nor Class C is found upon second examination shall be marked B1, A2, and submitted to a third examination.

(*h*) All samples marked B1 in which Class B only is found shall be marked B1, B2, and submitted to a third examination.

(*i*) All samples marked B1 in which Class C is found upon second examination shall be marked B1, C2, and condemned.

Examination of third preparation.

(*j*) All samples marked A1, A2, in which neither Class B nor C is found upon third examination shall be marked A1, A2, A3, and passed for foreign markets.

(*k*) All samples marked A1, B2, in which neither Class B nor Class C is found upon third examination shall be marked A1, B2, A3, and rejected for foreign markets.

(*l*) All samples marked A1, B2, in which Class B only is found upon third examination shall be marked A1, B2, B3, and rejected for foreign markets.

(*m*) All samples marked A1, B2, in which Class C is found upon third examination shall be marked A1, B2, C3, and condemned.

(*n*) All samples marked B1, B2, in which neither Class B nor Class C is found upon their examination shall be marked B1, B2, A3, and rejected for foreign markets.

(*o*) All samples marked B1, B2, in which Class B only is found upon third examination shall be marked B1, B2, B3, and rejected for foreign markets.

(*p*) All samples marked B1, B2, in which Class C is found upon third examination shall be marked B1, B2, C3, and condemned.

By the term "foreign markets" is implied the countries requiring microscopic inspection of American pork.

Whenever a fourth preparation is examined it shall be marked as indicated above.

According to this system the following marks are possible: A1; A1, A2; A1, A2, A3; A1, B2; A1, B2, A3; A1, B2, B3; A1, B2, C3; A1, C2; A1, A2, C3; B1; B1, A2; B1, B2; B1, C2; B1, A2, A3; B1, A2, B3; B1, A2, C3; B1, B2, A3; B1, B2, B3; B1, B2, C3; C1.

8. A reduction of 1 will be made in the monthly rating for attendance for each case of tardiness in the morning and after each intermission.

(*a*) Perfect discipline must be maintained during working hours and all unnecessary talking and confusion must be avoided.

A reduction of 1 will be made in the monthly rating for deportment for each violation of this section.

(*b*) Each assistant microscopist is responsible for the condition of her microscope and its accessories. When they are not kept clean a reduction of 5 will be made in the monthly rating for work. The microscopist in charge is directed to make a personal inspection of all the instruments intrusted to each assistant at least once each month, and his grading is to be established by these inspections. The instruments of all the assistants will not be inspected at the same time, the inspection being conducted indiscriminately and at irregular intervals No alteration or repair of lenses is to be attempted by any of the assistant microscopists, but when the instruments are in need of the same the attention of the microscopist in charge shall be called to them. When repairs can not readily be made by the microscopist, a detailed report of all such instruments must be forwarded to this office.

(*c*) Each assistant microscopist will be furnished with four compressor frames and eight compressor glasses. The preparation and examination of each specimen shall be made as follows:

(*d*) The preparations must be thin, evenly distributed, and cover the entire visible portion of the glasses. The meat must not be disintegrated by pounding with a glass or other implement, but instead must be cut into thin slices with the scissors and pressed between the glasses.

(*e*) Water may be used in preparing the specimen, if desired, but as fresh meat can be prepared without water, and as the work is much cleaner when it is not employed, its use is not recommended.

Failure to use care in making preparations, as above indicated, will cause a reduction of 1 in each instance in the monthly rating for work.

(*f*) Prepare meat from one piece of the specimen, examine and place it aside, if free from "C's," prepare and examine the second preparation, and if it is free from "C's," lay it aside and prepare to examine the third.

After the third preparation has been made and examined, the fourth frame and glasses will be used in making a new preparation from another specimen, and if the first, second, and third preparations are not desired for re-examinations they may be cleaned and used as before described. When either the first, second, or third preparation, or all of them, are desired for re-examination, other frames and glasses will be furnished by the microscopist.

None of the preparations made from the same sample are to be removed for re-examination until the assistant microscopist has finished her examination of all of them.

(*g*) Each preparation must be thoroughly examined. When moving it along the grooves an even, steady movement must be maintained. Violation of this rule will lower the monthly rating for work 5 points.

The maximum number of specimens to be examined by any assistant microscopist is to be limited to forty per diem.

(*h*) When Class B is found, the attention of the one in charge must be immediately called to the same, and the examination completed as previously instructed.

When Class C is found, the attention of the one in charge must be immediately called, and, if it is determined by him to be such, further examination of the sample shall not be made. Such samples shall be taken up and retained by the microscopist.

The re-examinations shall be confined to preparations which have been passed as being Class A.

(*i*) Samples in which trichinae are found upon re-examination will be reported by the person making the re-examination, and not by the one who prepared the specimen.

These specimens will be reported on the M. I. 33 form in the column for missed trichinae, opposite to the name of the person having missed them, and again in their respective column, under the heading "Number of trichinae found," opposite the name of the re-examiner.

A reduction of 10 will be made in the monthly average for work for missing Class C and of 3 for missing Class B.

(*j*) The microscopist will limit the number of samples taken by each assistant for examination to the number which can be properly examined each hour. A proper record must be made by each assistant of the number so taken.

(*k*) Five per cent of the specimens examined by each assistant shall be re-examined by the microscopist in charge, but when it is impossible for him to do so he may detail an experienced assistant to that work. Such detail shall not be continuous, but changes must be made from time to time.

(*l*) All samples of Classes C and B must be verified by the microscopist.

(*m*) The tags in samples of Classes B and C must be marked accordingly by the microscopist and must be attached to and accompany the report to the inspector, who will in turn forward the same to the employe whose duty it is to remove and dispose of rejected and condemned carcasses; after the hogs have been removed and marked by "Condemned" tags and brands, the tags with the duplicates shall be returned to the

microscopist for comparison with each other and the M. I. 17 slip.

All other tags must be retained upon spindles by the assistant microscopists for comparison with the M. I. 16 and M. I. 17 slips.

(*n*) Clerical errors will cause a reduction of 1 in rating for work.

(*o*) On the M. I. 33 report, in the column for remarks, the microscopist will note the number of the section of these rules the violation of which has caused a reduction in rating.

9. Any dishonesty in connection with the examination of specimens or in making out reports will be sufficient cause for removal.

10. As soon as the report of the microscopist is received by the employe whose duty it is to supervise the cutting and disposal of passed, rejected, and condemned carcasses, he shall immediately brand upon each ham, shoulder, and side of each carcass belonging to Class C the letter "C," and upon each ham, shoulder, and side of each carcass belonging to Class B the letter "B." These brands shall be in addition to condemned tags attached with wire and lead seals. Such branding stamps and ink will be supplied from this office.

11. The assistant microscopists when continuously employed shall be allowed an intermission of fifteen minutes in the middle of the forenoon, and the same in the middle of the afternoon, and one-half hour at noon.

On Saturday's, until further notice, they shall begin work at 8 a. m. and suspend at 12, noon, unless there is a demand for more inspection than can be accomplished in these hours.

12. All pork exported to Switzerland must be accompanied by certificates of inspection, the regular inspection and white certificates being sufficient. Pork cured or packed in borax will not be received by that country.

13. Meat extracts, soups, lard, tallow, oleo oil, or grease must not be stamped or certified to; certificates of inspection

are not required by B. A. I. Order No. 1, when such products are exported. Unmelted swine and beef fat from animals inspected and passed may be stamped and certified to.

14. It is not necessary that the heads of hogs which are to be microscopically inspected be retained until after that examination, unless the meat from the heads is to be used for shipment to countries requiring such inspection. In all cases, however, the heads must remain attached to the carcasses until after they have passed the regular examination at the bench.

15. Cows not within two weeks, and swine and sheep not within one week, of parturition, and which are condemned on account of their pregnant condition, may be rendered into lard and tallow, providing there are no other conditions or diseases existing which under the regulations require their condemnation.

16. Whenever shipments of Southern cattle are made to any of the cities where this Bureau has inspection, notice of the same shall be sent on the M. I. 22 form to the official at that point, and similar notice sent to this office upon the M. I. 21 form. When shipped to points at which this Department has no representative, you will notify the railroad agent at the point of destination that they are Southern cattle and that the car must be washed, cleaned, and disinfected. You will also inform him of the car number and initials, and inclose a copy of the regulations referring to the transportation of Southern cattle.

17. When freezing weather prevails you will not require that sheep affected with and exposed to scab be dipped. During such times affected sheep may be shipped for slaughter only in sealed cars. Notice of such shipment must be sent by telegraph to the inspector at the point of destination.

18. All cases of negligence and incompetency upon the part of any of the Bureau employes, or failure upon the part of managers and employes of abattoirs to comply with regulations

and instructions, must be immediately reported to this office by the inspector in charge, giving information in detail regarding the same.

All meats which are certified to by marking with stamps, tags, brands, or seals must receive a careful inspection, and all stamps, tags, brands, or seals identifying the same must be carefully and securely attached. If at any time your force is insufficient to give this work the careful attention indicated you will immediately notify this office of the required increase.

The inspection and service in general must be carried out as required by the rules and regulations, and the inspector in charge will be held accountable if this is not done, unless he has called the attention of this office to the employes at fault.

Each employe must become fully informed regarding the Rules and Regulations and these instructions; failure to do so will be considered in fixing the rating for efficiency.

The inspectors in charge shall furnish a copy of each to those upon their forces.

D. E. SALMON,
Chief of Bureau.

Washington, D. C., March 16, 1899.

VII. INSTRUCTIONS TO MEAT INSPECTORS.

1. GENERAL.

Section 1. The meat inspection must be done in daylight. In cases of emergency the examination of the living animal may be done in the evening with plenty of lamp light, but the final inspection must never be made by artificial light.

2. EXAMINATION OF ANIMALS DURING LIFE.

Section 2. In the examination of animals during life there is to be a general inspection, in which is noted the general nourished condition (emaciation). The inspector is to inform himself as to whether the animal is free from fever. If indications of fever are present (drowsiness, chills, insensibility, staring look, weakness), then the temperature of the body must be

taken with a thermometer, which shall indicate the condition of the body temperature.

Section 3. In continuing the examination special attention should be paid to the following:

1. The skin is examined for the presence of wounds, and it is noted whether they lead into body cavities, articulations or bones, and whether they contain any purulent discharges, or bone splinters.

2. The visible mucous membrane of the eye should be noted as to whether it is very red and yellowish in color (feverish condition), hemorrhagic (anthrax, blood poisoning), or of a light color (pneumonia).

3. The anus and tail are to be examined as to whether there has been any diarrhoea, or whether the feces indicate any hemorrhage, or strong offensive odors.

4. The very offensive and purulent discharge of the vagina (soiling of the tail and hind quarters) are indications of parturition.

5. Labored or accelerated breathing indicates affection of the lungs. Impaired digestion and a very bloated, or a very emaciated abdomen indicate stomachic and intestinal trouble.

6. In abnormal locomotor symptoms (lameness, paralysis), careful examination is made of the hoofs (foot and mouth disease), then the bones (fractures), and the articulations (indicated by swellings and injuries of the affected parts).

Section 4. In the various species of animals one must give the following symptoms special importance:

(*a*) In cattle:

1. Very warm swellings in different parts of the body (anthrax and blackleg); cold swellings on the abdomen in connection with accelerated breathing (protruding of foreign bodies from the stomach into the breast cavity); prominent protrusion of the flanks (bloat); punctures of the left flank (puncture for bloat).

2. An excess of salival fluid, or soiling of the tongue, ulcers on the mucous membrane of the mouth and tongue (foot and

mouth disease); swellings on the tongue and jaw (actinomycosis); discharge from the nose with ulcers, watering of the eye (malignant catarrhal fever).

3. Swelling and inflammation of the vagina or vulva ("oestrum"); a purulent or mixed-colored, very offensive discharge of the vagina, soiling of the tail and hind quarters, sinking of the muscles of the pelvis (parturition trouble).

4. On the udder: vesicles (foot and mouth disease); non-sensitive nodules with enlargements of the glands (tuberculosis); general swelling often combined with lameness (acute inflammation of the udder); non-sensitive, thickening and enlargement (chronic ulcers); a full udder with distinctly marked blood vessels (a fresh milker).

5. Lameness is always an indication that a thorough examination should be made of the hoofs (foot and mouth disease).

(*b*) In calves:

1. A soft, offensive smelling navel, containing pus, and swollen joints of both front and hind limbs with lameness (joint disease).

2. Flanks drawn up, a very offensive feces which soils the tail and hind quarters (peritonitis or gastro enteritis).

(*c*) In swine:

1. Animals unconscious of surroundings, hiding in the straw, dropping of the tail (general symptoms of disease).

2. A dark red color of the skin, neck, ears, abdomen and inner surface of the thigh (swine plague, pleura pneumonia, hog cholera); dark or light red, sharply outlined spots on the skin (erysipelas).

3. Very loud squeals when aroused, lameness or very stiff movements, and hemorrhage of the hoofs indicate that an accurate inspection should be made of the hoofs. Froth at the mouth indicates the necessity of careful examination of the mucous membrane of the mouth and tongue (foot and mouth disease).

4. Very offensive grayish red or yellow feces (gastro enteritis); coughing and accelerated breathing (inflammation of the lungs, hog cholera).

5. Swellings of the joints (tuberculosis or effects of swine plague or hog cholera); swellings of the head, neck and ears (quinzy or bite wounds).

(*d*) In sheep and goats:

1. Pale mucous membrane, cold and doughy swelling of the skin at the neck as far as the lower jaw (worm disease).

2. Uneven fleece, a strong itching sensation with eruption on that part of the head which is covered with wool, pustules and scab with inflammation of the non-fleeced parts of the body (pox).

3. Lameness is always an indication that a closer examination of the hoof and mucous membrane of the mouth should be made (foot and mouth disease).

Section 5. If the animal is free from fever and shows none of the above symptoms then the meat is considered free from any influence that may be injurious to the health of the human being, and can be consumed.

Section 6. Animals that are exhausted on account of transportation are to be excluded from killing until they are thoroughly rested.

Section 7. Animals affected with a plague, or suspected of being affected with any contagious disease, are to be separated and the sanitary police and the state authorities notified immediately. The killing of such animals before the sanitary police or the authorized veterinarian has seen them is prohibited.

Section 8. Animals affected with fever and such animals whose meat may have a detrimental effect upon the human being must be excluded by the stock inspector.

3. EXAMINATION OF SLAUGHTERED ANIMALS.

Section 9. Examination of slaughtered animals takes place as soon after death as possible.

Section 10. The examination is conducted in the following manner:

(*a*) Cattle:

1. The pleura is examined for tubercular adhesions and growths. The lung is palpated to ascertain whether there are nodules (tubercular, pus cavities, inflammation of the lungs, bladder worms). The bronchial and mediastinal glands are to be cut into (tuberculosis). There is to be noticed further, the dark coloration, and the uniform red coloration of the blood (the gravitation of the blood after death to the deep seated parts); the red coloration of certain lobes (entrance of the blood due to the puncture); a gelatin-like or grayish red color (presence of water); abnormally large lungs, especially the posterior lobes, and air vesicles under the pleura and between the lobes (blown-up lung). Finally the lung is to be cut into lengthwise (lung worms, food stuffs in the bronchial tubes).

2. The pericardium is to be cut into and examined to ascertain whether it is adhered to the lungs, or heart, and whether it contains a gelatinous or pus-like substance (foreign bodies from the stomach); dense, soft induration (foreign growths). The heart chambers are to be cut into. The left chamber filled (poor bleeding); hemorrhage on the outer and inner surface of the heart (blood poisoning); enlargement or a streaked gray coloring (foreign growths). Finally the muscles of the heart are to be examined for taenia.

The diaphragm and the parts that are cut out with the viscera are to be examined for growths or pus cavities (foreign bodies from the stomach); also for tubercular nodules.

3. The liver must be examined for swellings (rounding of the borders); grayish yellow, or dark red coloration, adherence to other organs, pus cavities (foreign bodies from the stomach); tubercular nodules on the serous membranes. The liver is to be palpated (pus, tubercular nodules, bladder worms and thickness of the gall ducts). Incisions are to be

made at the posterior surface of the liver into the left half and the Spigelian lobe. By pressure upon the gall ducts examination is made for the presence of the liver fluke. The lymphatic glands of the liver are to be cut into (to distinguish between decalcified bladder worms and tuberculosis).

4. The spleen must be examined for swellings (rounding of the borders); dark red coloring, softening (anthrax and blood poisoning); the spleen must be thoroughly palpated (tubercular nodules, pus cavities, or bladder worms). If the presence of tubercular nodules is detected it must be determined whether they are present within the spleen or upon the serous coat of the same.

5. In the head the tongue is to be cut out at the base and an examination made for vesicular eruptions, ulcers and marked redness of the mucous membrane of the mouth, gums and tongue (foot and mouth disease, rinderpest). The bones of the jaw and also the tongue are to be felt (actinomycosis). The muscles of the jaw are to be cut into (taenia); likewise the lymphatic glands of the pharynx and lower jaw (tuberculosis, actinomycosis).

6. The external and internal surfaces of the gastro-enteric canal are especially examined.

(*a*) On the outer surface, grape-like or membranous nodules are to be looked for, clusters of which may be very numerous (tuberculosis and peritonitis); general and small circumscribed hemorrhages (anthrax, blood poisoning and gastro enteritis); and perforations leading to the exterior (foreign bodies, ulcers).

(*b*) On the inner surface: inflammation, hemorrhage, marked folds, ulcers, membranous adhesions, gelatinous discharge (gastro enteritis, anthrax and blood poisoning); thickening of the abomasum and the rectum (foreign growths); growths, perforations, formation of pus, putrefaction on and between the stomach and the stomach divisions, especially of the riticulum (perforations by foreign bodies).

7. The mesentery and omentum are to be examined for hemorrhages and purulent discharges on the outer surface of the intestines. The mesenteric glands are to be cut into (tuberculosis and flukes).

8. The uterus is to be examined and its fulness and distention noted (pregnancy, or the accumulation of purulent matter). The uterus and the vagina are to be cut into for the examination of purulent discharges, ulcers, or the accumulation of pus, and perforations (purulent inflammation of the uterus, tuberculosis, undeveloped or decayed embryos).

9. The meat (both sides) is now examined as to its condition (leanness or emaciation); and then for the yellow color (jaundice, or yellow fat caused by grass); watery infiltration, gelatin-like discharges, hemorrhages, colorations, and besides the smallest hemorrhages are to be cut into (fractures, bruises, wounds, purulent discharges). The gloss, the color and the consistency of the fat and of the meat are to be closely examined, also the visible bones (vertebrae, breast bone); and the tendons and joints (tuberculosis and purulent discharges); the muscles of the neck, are to be examined for taenia. Upon the detection of tuberculosis on either of the foregoing organs, the lymphatic glands of the body (elbow and flank glands) are to be cut into.

10. On the udder may be detected vesicular eruptions and ulcers (foot and mouth disease, cow pox). The four quarters are to be felt separately for the detection of nodules (tuberculosis, purulent discharges). The lymphatic glands of the udder are to be cut into.

11. The kidneys are to be palpated (nodules, parasites), and the lymphatic glands of the kidney are to be cut into (tuberculosis, hemorrhage, enlargements). If the lymphatic glands of the kidneys are not altered, then it is not necessary, as a rule, to cut into the kidneys. The suprarenal capsules are to be cut into.

12. The inner surface of both sides must be examined for

inflammation, hemorrhage, especially on the inner side of the pelvis, swelling and hemorrhage on the inner side of the sacral bones (fractures of the pelvis, parturition trouble); membranous adhesions, foul smelling or suppurating condition of the pleura and peritoneum. Perforations through the digestive canal (foreign bodies, puncture wounds of the breast and abdomen caused by the operation for tympanitis). In the examination of the pleura it is necessary to lift up the diaphragm.

13. The skin is to be examined on the inner and outer side, especially as to fulness of the blood vessels (extent of bleeding); hen.orrhages, purulent discharges (anthrax, bruises); on the upper surface, wounds and thickenings (actinomycosis).

In other animals the post-mortem examination is to be conducted in the same manner, but there are some important points to be noticed in connection therewith.

(*b*) Calves:

1. The navel and front and hind metacarpal joints are to be examined for the presence of gelatinous discharges, pus formations and discolored secretions (joint disease).

2. Inflammation, hemorrhage, or accumulations on the peritoneum and the serous membrane of the intestines (peritonitis) generally caused by ulcers eating through the stomach.

3. Inflammation of the intestines, very offensive discharge, and soiled tail (gastro enteritis).

4. Air spaces between the muscles, especially on the elbow and flank (blown-up meat).

(*c*) Swine:

1. The lobes of the lung are always to be cut into (lung worms); likewise the lymphatic glands of the lower jaw (tuberculosis).

2. The muscles of the heart, larynx, pharynx, tongue and abdomen (after the removal of the entrails), neck and loins are always to be examined for taenia, or calcareous deposits.

3. The skin must be examined for dark red spots (swine

plague, swine pneumonia, hog cholera); round, circumscribed, dark red or pale spots (erysipelas); small, circumscribed spots, very often covered with crusts, which upon incision frequently contain a purulent discharge (injuries and bite wounds).

4. Grayish red thickened masses in the lungs, adhesions of the lungs and diaphragm, inflammation, swelling and ulcers on the mucous membrane of the stomach and intestines (swine plague, pneumonia, hog cholera).

5. Oily, fishy or buck-like odor of the meat (boar meat, or caused by bad feed).

(*d*) Sheep and goats:

1. Emaciation, watery infiltration or yellowish coloration of the meat and fat (worm disease, jaundice).

2. Purulent, usually capsuled, masses in the lungs.

3. Buck-like odor (billy goat).

4. EXAMINATION OF THE SLAUGHTER HOUSE ANIMALS.

The meat inspector can render a correct opinion as to the condition of the meat only when he has detected every abnormity of the animal, which is not very easily done. In the examination the symptoms are overlooked more often than is generally supposed. It therefore requires the strictest conscientiousness, a thorough knowledge and a certain training in order to be capable of distinguishing between the normal and the abnormal. The trained as well as the untrained must therefore guard against mistakes and the blame of making superficial examinations, so that he accustoms himself to making accurate examination in each case, regardless of whether the animal or meat shows signs of disease. Nothing can bring the meat inspector more under suspicion of ignorance and partiality than if he inspects one animal with more accuracy and conscientiousness than another. He must always for this reason strive to obtain the confidence of the tradesmen, which is very difficult, but which is finally obtained through conscientiousness and enduring zeal and thoroughness. However, it is

not sufficient to know only the methods of inspection, but it is necessary that the meat inspector has had practical experience in numerous cases, if he wishes to attain trustworthiness.

(A) Ante-Mortem Examination. It is often believed, even among experts, that an ante-mortem inspection of the animal is not necessary except in the rarest cases. This idea is entirely erroneous. For a correct decision as to the condition of the meat it is always of great importance not only to make a close inspection of the apparently healthy animal, but also to examine especially those that are evidently diseased. Exceptions are made only when the life of the animal is threatened. Such animals must then be examined with especial care.

The ante-mortem inspection is requisite to the prevention of the spread of contagious diseases. Animals which suffer from a contagious disease are recognized as such by the examination, and can at once be isolated. In addition to this fact, a few diseases (e. g., rabies) are recognized only by aid of the characteristic symptoms displayed during life, and others (e. g., anthrax, glanders, rabies) can be transmitted to man by inoculation. Further, the most dangerous acute diseases can be detected only when an examination has been made during life, because the pathological changes of the meat are often so slight that they can be easily overlooked, and thus do great harm to human health. In abbatoirs where the blood of the different animals is poured together, upon the strength of the ante-mortem examination, the blood of healthy and suspected animals may be caught and preserved, so that thereby the contamination of a large amount used in the manufacture of sausage may be prevented. Finally, it is to the interest of the insurance of cattle that diseased and suspected animals be detected before being slaughtered, and excluded from insurance.

For a better understanding of the condition coming under consideration, the following is given:

By fever is understood a condition in which a strong pathological change in the body takes place, which first causes a

rise in the body temperature. The rise of the body temperature is therefore the most important symptom in the diagnosis of fever.

The normal temperature of the different animals is as follows:

Horses	99.5°-101.3° Fahrenheit
Cattle	100.4°-102.4° Fahrenheit
Sheep	102.2°-105° Fahrenheit
Swine	100.4°-104° Fahrenheit

If the temperature of the body is elevated it can be detected by touching the skin, the mucous membrance (anus and mouth), and by the expired air. Yet it is to be noted that the protected parts (beneath the neck, mane, tail, etc.) are warm, as are also the limbs and rump. Accurate determination of the body temperature is obtained only by use of the thermometer, which in animals is applied per rectum and allowed to remain there at least five minutes.

Besides the elevation in temperature there are, as a rule, other symptoms of fever:

(*a*) The heart action is increased, which is best determined by feeling the pulse (see page 24). In the horse the pulse is felt on the exterior maxillary artery (on the inner surface of the lower jaw); in cattle on the same artery (on the outer surface of the lower jaw); in the other animals on the femoral artery (on the inner surface of the femur). The normal pulse-beats per minute are as follows:

Horse	33—40
Cattle	40—50
Sheep	60—70
Swine	70—80
Dog	70-120

In the normal, healthy condition, the pulse as a rule is regular, i. e., the pulse-beats follow one another regularly, with

uniform intermission, and thus the beats are equally strong (see page 23). During fever the pulse is perceptibly accelerated, irregular, weak and often of unequal volume.

(*b*) The respiration as a rule is accelerated. The normal number of respirations per minute is as follows:

Horse	10—12
Cattle	12—15 (30)
Sheep	12—20
Swine	(8) 12—20
Goat	12—20

Under normal conditions the breathing is quiet, without exertion (see page 22). The determination of the number of respirations is ordinarily not easy, as the animals do not stand still and are generally excited during the examination. Therefore the number of respirations in animals to be slaughtered is of little importance for diagnosis, whether the animal shows difficult breathing or not. Labored breathing is shown by strong movements of the nasal cavities, abdominal walls and anus.

(*c*) Consciousness is gone. The animal hangs the head or props it upon something, pays little or no attention to the surroundings, is drowsy and has a dull, often staring, look in the eye.

(*d*) Chills occur, either over the entire body or in single muscle groups. These must not be confused with movements of the skin which the animal performs voluntarily to remove flies, dirt, etc. Besides this, animals shiver from cold or fear, or when they are in a strange stall, or when in pain, etc.

(*e*) The animal does not take food, but on the contrary is fond of water. Cattle and sheep cease rumination. The feces are generally hard and covered with a slimy coat, or there is diarrhoea.

(*f*) Urination is slight. The urine voided is mostly dark, becoming turbid upon cooling.

(*g*) The animal emaciates quickly. The mucous membranes (of eye, mouth, rectum, vagina and nose) are of a darker, sometimes yellowish color. The tongue and mucous membrane of the mouth are dry and warm, as is true of the nose of cattle.

In every case these symptoms are not always present, but the elevation of temperature always exists in a fevered animal. However, it is to be noticed that the thermometer indicates irritation in the rectum, also that the body temperature in very sick animals may be below normal just before death. The most prominent symptoms are coma, the absence of attention to the surroundings, weakness, staring look and chills. The presence of these symptoms compels the meat inspector to make a thorough examination of the animal, and in the first place to take the temperature per rectum with a thermometer. In the usual ante-mortem examination of animals it is of importance to determine the general condition. Well-fed animals have a rounded body; the hair is smooth and glossy. Poorly fed animals show a "bony" body; the hair is uneven, rough and has no gloss. The skin is hard and upon forming a fold the hair will crack and the fold remains for a longer time. By the so-called handling no fat is detected. The temperament of the animal is also to be noticed. Lively animals have a very fiery look, take in the surroundings, are very active and are willing to work and partake of their food. Lazy animals show very slow movements and the expression is not well marked. All these symptoms have a tendency to indicate fever, and for this reason are of importance. Through active work the meat inspector soon learns to distinguish these characteristics. To avoid repetition of the method of examination we draw attention to paragraphs 2 and 4, pages 83-84 and 85. In a general way the following may be added:

Healthy animals will, as a rule, take in the surroundings, have a very free countenance and partake of their food and water. If the animals are tired and have undergone strong exertion they show accelerated breathing, with an increased

pulse, which, if the animal is healthy, soon returns to normal. In cases where animals have undergone strong exertion this condition may exist for twenty-four hours or over.

1. In cattle:

In healthy animals the nose and mouth are moist. The horns are colder on the points than at the base. Healthy animals ruminate; sick ones do not. Fresh cows have a full udder and the blood vessels are plainly visible thereon. In cattle the meat inspector must look especially for the following diseases: Anthrax, foot and mouth disease, rinderpest, puerperal fever, inflammation of the udder, gastro enteritis, peritonitis (tympanitis and foreign growths).

2. In horses:

Here the meat inspector must look for glanders and scab.

3. In calves:

Here the navel plays an important part, as well as lameness, swelling of the articulations and diarrhoea (soiled tail).

4. In sheep and goats.

Sheep, as a rule, suffer from chronic, emaciating diseases (worm diseases). Besides this it is advisable to look for scab, pox, foot and mouth disease.

5. In swine:

Healthy pigs are lively and, as a rule, have a curl in the tail, grunt when disturbed and root in the ground looking for feed, Sick pigs hide themselves in the straw, are very drowsy, do not notice the surroundings, and let the tail hang straight. In swine it is important to notice foot and mouth disease, swine plague, swine pneumonia, hog cholera and gastro enteritis. Of the diseased or suspected animals one must take a minute description (signalement) in order to know the animals later. It is done as follows:

By noting the species, the sex, the color, the points, the age, and the breed. For example, a cow, black, with a white abdomen, on the left shoulder a white spot (star) about the size of a hand, the right horn is gone, age five years. The points that are

not prominent are not to be mentioned. The history of the case is of little importance to the meat inspector, because it very often does not correspond with the facts. The owners of diseased or suspected animals are always interested and try to deceive the inspector. Their story of the sad misfortune that happened to the animal on the way just before reaching town should always be taken with due precaution.

(B) Post-Mortem Examination. The post-mortem examination is not the same universally. Some inspectors are content with looking at both sides of the cut-up beeves or at the emboweled part of a small beef at a greater or less distance. Others allow a third person to hold a preliminary examination and they themselves examine only those animals which are suspected by the expert; while others are allowed to be examined entirely by a third person. This is done in certain parts of Germany, but not in this country. As far as the writer knows, only ante-mortem examinations are allowed to be made by the stock inspectors. All these methods of examination are very faulty and the meat inspector should make the examination himself with the knife in his hand. It is of importance that the meat inspector have more than one set of knives, and always a different knife when he makes an incision into condemned meat (degenerated tubercular nodules, etc.). Knives that have been used should be thoroughly cleansed with boiling water or held over a fire before they are used again. The meat inspector should cleanse his hands thoroughly and disinfect the same after he has handled condemned meat. If these rules are not followed, the inspector may do more damage than he would by allowing condemned meat to pass. When possible the meat inspector should be present at the slaughtering, in order to examine possible abnormities of the contents of the body cavity, adhesions of the organs, etc., to ascertain the pathological condition of these abnormities, for often owners endeavor to remove affected parts as in tuberculosis, pus cavities, tape-worm cysts, worms, pleura,

peritoneum, lymphatic glands, etc. As a rule it is a very easy matter for the expert to detect such fraud and then have them produced by the owner for inspection. If the meat inspector is not present at time of slaughtering, all organs should be left in their natural position.

Organs that are to be removed are to be left hanging together in as natural a position as possible so that no mistake can be made. To avoid repetition we refer the reader to paragraphs 9 and 10, pages 87-92. The post mortem examination of the animal is one important feature for the meat inspector, for upon this ground only can he determine whether or not the meat is wholesome. The greatest task is the examination of internal organs. Every organ is, therefore, to be carefully examined to determine its pathological condition. Upon examination of the organs one must consider: The size (expansion); the form (nodules, abnormal growths), the color, gloss and internal condition (the blood contained therein, the surface of the incision, hardening or softening, etc.). Therefore it must be borne in mind that the organs of animals bled poorly or not at all, always appear different (fuller and darker) than those of well bled animals.

The most important diseases are:

1. In cattle. Tuberculosis. If the meat inspector finds tuberculosis in any of the organs, then he has to deal with it as on page 144. Besides, we must examine for anthrax, foot and mouth disease, puerperal fever, inflammation of the udder, gastro enteritis, peritonitis, pericarditis, as well as those discases which are caused by purulent discharges of pus into the blood. Likewise of importance are the cattle tape worms, the liver fluke and the bladder worm.

2. In horses. The most important disease is glanders. The head must be examined, which is done by cutting open lengthwise to detect the glandular nodules. The larynx, trachea, lungs, and bronchial tubes and their lymphatic glands must also be examined for glandular nodules.

3. In calves. The age of the calf and the condition of the navel are of greatest importance in the examination. Besides purulent discharge in the articulations, peritonitis and gastro enteritis (ulcers) are to be especially looked for.

4. In sheep and goats. The condition of sheep is very much impaired by the liver fluke and the thread worms (in the lungs and stomach), tape worms and the like. The meat is often watery and yellow as a result of these. The meat of billy goats has a characteristic odor.

5. In pigs. The examination for trichinae is of the greatest importance, also swine plague, swine pneumonia, hog cholera and foot and mouth disease. On examination for trichinae one must remove some of the meat. Tuberculosis in pigs is seen quite often, especially on the under jaw and in the pancreas. The meat of the boar has a peculiar odor.

VIII. U. S. BUREAU OF ANIMAL INDUSTRY.

MEAT INSPECTION.

From the tables furnished by the Chief of the Bureau of Animal Industry it is learned that during the year (1898) there were 9,228,237 ante-mortem inspections of cattle, 10,028,287 of sheep, 468,199 of calves, and 31,610,675 of hogs, making a total of 51,335,398 inspections. This is a total gain over 1897 of 9,025,291 animals, divided as follows: Cattle, 1,178,212; sheep, 1,983,932; calves, 19,216; hogs, 6,043,931. The condemnations at abattoirs were 104 cattle, 741 sheep, 67 calves, and 9,679 hogs—a total of 10,591. The rejections in stock yards were 27,491 cattle, 9,594 sheep, 2,439 calves, and 66,061 hogs —a total of 105,585. The number of condemned animals at abattoirs was 3,275 fewer than in 1897, and the number rejected in stock yards was 27,247 greater. These differences show the careful work of the officials in detecting disease previous to the slaughter of the animals.

The records of the post-mortem work show 4,433,181 in-

spections of cattle, 5,501,675 of sheep, 245,155 of calves, and 20,936.840 of hogs. Of the carcasses condemned, 10,018 were cattle, 3,567 were sheep, 344 of calves, and 77,579 of hogs; and of parts of carcasses condemned, 12,591 were of cattle, 287 of sheep, 52 of calves, and 35,250 of hogs.

In addition to the above there were killed by city inspectors 1,785 cattle, 1,509 sheep, 192 calves, and 14,698 hogs which had been rejected in the stock yards by officers of the Bureau of Animal Industry.

The meat inspection tag, or brand, was placed on 14,815,753 quarters, and 968,014 pieces of beef, 5,448,477 carcasses of sheep, 217,010 carcasses of calves, 680,876 carcasses of hogs, and 394,563 sacks of pork.

The meat inspection stamp was affixed to 4,433,569 packages of beef products, 5,163 packages of mutton, and 10,145,048 packages of hog products, of which 374,131 contained microscopically-examined pork.

The number of cars sealed containing inspected meat for shipment to packing houses and other places was 18,631.

There were issued 35,267 certificates for meat products which had received the ordinary inspection; these covered exports comprising 1,256,716 quarters, 67,120 pieces, and 735,814 packages of beef, weighing 339,650,091 pounds; 5,163 packages of mutton, weighing 324,996 pounds; 39,212 hog carcasses and 653,564 packages of pork, weighing 244,956,482 pounds.

The cost of this work was $409,138.09, which makes an average of 0.8 cent for each of the 51,335,398 ante-mortem inspections, besides covering all the subsequent work of post-mortem inspections, tagging, stamping, etc.

The cost of inspection has been gradually growing less year by year. The average cost per head was 4¾ cents in 1893, 1¾ cents in 1894, 1.1 cents in 1895, 0.95 cent in 1896, and 0.91 cent in 1897.

The number of animals inspected before slaughter is shown

in the statement below. The figures of 1897 are given also as a means of comparison.

Animals inspected before slaughter for abattoirs, 1897 and 1898.

Fiscal year	Cattle	Calves	Sheep	Hogs	Total
1897.....	4,289,058	259,930	5,179,643	16,813,181	26,541,812
1898.....	4,552,919	241,092	5,706,092	20,713,863	31,213,966
Increase..	263,861	*18,848	526,449	3,900,682	4,672,154

*Decrease

MICROSCOPICAL EXAMINATION OF PORK.

The examination of pork and pork products shows that better results are obtained by making the inspection in the carcass than when samples from cured meat are examined. The following table shows this fact quite clearly:

Comparison of inspections from carcasses and from pieces.

Samples	From carcasses		From pieces	
	Number	Per cent.	Number	Per cent
Class A.....	1,892,131	98.148	864,042	98.747
Class B.....	15,729	.816	5,064	.579
Class C.....	19,978	1.036	5,902	.674
Total.....	1,927,838	100	875,008	100

The samples of pork submitted for microscopical examination were classified as follows: Class A, samples in which no sign of trichinae living or dead, or calcified cysts are found; Class B, samples in which degenerated trichinae cysts are found, but in which the body of the parasite is not recognizable; Class C, samples in which recognizable bodies living or dead, of trichinae are found. All hogs belonging to the latter class must be condemned and disposed of according to section 20, of the regulations dated June 14, 1895.

The number of certificates issued for microscopically examined pork was 20,158, covering shipments aggregating 373,366 packages, weighing 120,271,659 pounds. Of this quantity, 698 packages, weighing 161,303 pounds, were exported to countries not exacting a certificate of microscopic inspection.

The cost of microscopic inspection was $171,040.94, an average per specimen examined of 6.1 cents, or an average of 0.142 cent for each pound exported. This cost per pound for the inspection of pork shows a remarkable reduction from the cost in 1897, when it was 0.256 cent. The cost in 1896 was 0.264 cent; in 1895, 0.2 cent; in 1894, 0.248 cent.

The microscopically inspected pork for 1898 reached the enormous amount of 120,271,659 pounds. Only 161,303 pounds of this went to countries not requiring inspection. In 1897, 43,572,355 pounds of pork were inspected microscopically, 1,001,783 pounds of which went to countries not requiring inspection. These figures show that countries requiring inspection received from us in 1898, 120,110,256 pounds of pork, as against 42,570,572 in 1897—an increase of 77,539,784 pounds. It is worthy of note here that the amount of pork microscopically inspected in 1898 exceeded the total amount of the three previous years by 18,703,906 pounds.

The number of samples examined increased 49 per cent over last year, the expense increased 53 per cent, and the exports increased 176 per cent.

INSPECTION OF VESSELS AND OF ANIMALS FOR EXPORT.

The number of inspections of American cattle for export was 859,346, and 1,438 head were rejected; 297,719 inspections of American sheep were made and 180 head rejected. The number of Canadian cattle inspected was 19,397, of which 5 were rejected; 29,497 Canadian sheep were inspected and 38 of them rejected.

The number of clearances of vessels carrying live stock was 971, as against 954 in 1897.

Inspectors of the Bureau of Animal Industry in Great Britain inspected cattle from the United States to the number of 381,420, and sheep to the number of 151,863; cattle from Canada, 17,164; sheep from Canada, 27,912. This shows an increase of 20,898 cattle and a decrease of 9,408 sheep when compared with the report for 1897. The number of head of cattle lost in transit in 1897 was 2,323, or 0.61 per cent, as against 907 head, or 0.23 per cent for this year. The number of sheep lost in transit in 1897 was 2,676, or 1.39 per cent, as against 1,618, or 0.89 per cent, for this year.

The cost of the inspection of export animals, the supervision of Southern cattle transportation, and the inspection of animals imported from Mexico was $101,210.55. It is estimated that half of this expense is on account of the export inspection, and, with this as a basis, the cost of inspecting the 548,419 domestic cattle and sheep exported was $50,605.28, or 9.2 cents per head. The number of inspections made of these animals in this country was 1,157,065, and in Great Britain 533,283, making a total of 1,690,348, the average cost of inspection being 2.99 cents.

Following is a statement showing the inspection of domestic cattle and sheep for export, and number exported for 1898, compared with 1897:

Inspection and exports of domestic cattle and sheep, 1897 and 1898.

Year	Cattle		Sheep	
	Number of inspections	Number Exported	Number of inspections	Number exported
1897	845,116	390,554	348,108	184,596
1898	859,346	400,512	297,719	147,907
Increase (+) or decrease(—)	+14,230	+9,958	—50,389	—36,689

SOUTHERN CATTLE INSPECTION.

During the quarantine season of 1897 there were received and yarded in the quarantine division of the various stock yards 35,317 cars, containing 972,224 cattle; the number of cars cleaned and disinfected was 35,280.

In the non-infected area in Texas 225,096 cattle were inspected for identification of brands, prior to removal to other States for grazing.

INSPECTION OF IMPORTED ANIMALS.

The number of animals imported from Mexico and inspected at the ports of entry along the boundary line comprised 177,772 cattle, 64,207 sheep, 104 swine, and 3,053 goats.

There were imported from Canada for slaughter, milk production, grazing, feeding, etc., and not subject to quarantine detention, 79,907 cattle, 184,352 sheep, 374 swine, 2,998 horses, 2 goats, 8 mules, 1 deer, and 6 buffalo, of which 385 cattle, 6,867 sheep, and 217 swine were for breeding purposes.

INSPECTION OF HORSES AND HORSE PRODUCTS.

The appropriation bill for the fiscal year 1899 contains a provision "that live horses and the carcasses and products thereof be entitled to the same inspection as other animals, carcasses, and products thereof" named in the bill. Two abattoirs have so far been established, one at Linnton, Ore., and one at Brighton, Mass. The latter has been in operation but a few days. The former commenced operations on August 1, and during that month 721 horses were inspected, 88 of which were condemned. In September there were 905 inspections and 33 condemnations. The percentage of condemned animals is large, and is an indication that no mistake is made in extending inspection to horses. These abattoirs slaughter horses exclusively.

Regulations are being formulated for the inspection of live horses for export. It is believed that such inspection will

stimulate the demand abroad for our horses, especially in England, where the question of inspection of American horses has already been discussed to some extent. (Year book of the Department of Agriculture, 1898).

The course or order of post-mortem examination given by Dr. R. Ostertag "Handbuch der Fleischbeschau" pp 77-80.

For cattle (and horses this method can be used with slight modifications).

1. Skin (wounds, actinomycosis, anthrax swellings, skin diseases).
2. Head:
   (a) External examination (actinomycosis);
   (b) Nasal openings, lips, hard palate, jaws, mouth (foot and mouth disease, rinderpest);
   (c) Tongue, (actinomycosis, stomatitis, foot and mouth disease);
   (d) Inner surface of the jaw muscles (injury of teeth, incision made for cysts and tape worms);
   (e) Lymphatic glands, intermaxillary, laryngeal, subparotid, base of the ear, etc. (tuberculosis, actinomycosis).
3. Liver:
   Appearance, soft or hard consistency, incision into the portal lymphatics (degeneration, inflammation, parasites, abscesses, actinomycosis, tuberculosis).
4. Heart:
   Inspection after incision into the pericardium, incision into left and right ventricles after the usual custom of post-mortem (degeneration, hemorrhage, endocarditis, echinococcus, tape worms).
5. Lungs:
   Palpation, incision cross-wise, incision into mediastinal and bronchial lymphatic glands (tuberculosis, echinococcus, small thread worms, foreign substances, such as blood and food material).

6. Spleen:

Palpation, incision into it and lymphatic glands (swelling, echinococcus, tuberculosis).

7. Kidney:

Cut into halves, incision into renal lymphatic glands, incisions are usually made after kidneys have been removed from the fatty capsule (degeneration, inflammation of the pelvis, parasites, tuberculosis).

8. Stomach:

Internal and external surface examined (inflammation, abscesses, actinomycosis, secondary tuberculosis).

9. Intestines:

(Inflammation, parasites, intestinal anthrax, tuberculosis).

10. Mesentery:

Incision into the mesenteric lymphatic glands (hemorrhage, parasites, tuberculosis).

11. Omentum:

(Hemorrhage, tuberculosis).

12. Testicles, uterus:

Incision into them (inflammation, tuberculosis).

13. Bladder:

Appearance, press out contents (red cloudy urine, caused by Texas fever). Make an incision only when animals are suspected to be diseased.

14. Examination of the four quarters:

(a) Outer appearance (contents of blood, hemorrhage, oedematous tumors, parasites, tape worms, hemorrhages are to be examined if they are deep seated, broken bones are often noticed by a small swelling on the surface of the skin before the carcass is skinned). In females the udder is to be examined, incision made into the lymphatic glands, (mammitis, tuberculosis).

(b) Internal surface, peritoneum and pleura (hemorrhagic spots, inflammation, tumors, tuberculosis); the diaphragm should be examined carefully, often important pathological changes are overlooked.

(c) The vertebrae, pelvis and breast-bone (fractures, osteomyelitis, tuberculosis). The brain should always be examined when animals are suspected of diseases affecting the nervous system or the extremities, hoofs, ankles, etc.

For calves:

The post-mortem examination is similar to that of cattle with the exception that the spinal column is not examined. The following are important parts to examine:

1. The stomach:
   (Peptic ulcers).
2. The small intestines:
   (Hemorrhagic enteritis).
3. The mesenteric and portal lymphatic glands:
   (Beginning tuberculosis).
4. The navel:
   (Omphalophlebitis).

For sheep:

In the post-mortem it is important to examine the spleen for anthrax; the brain for tape worm cysts, coenurus cerebralis; the lungs, stomach and oesophagus and muscles for tape worms.

For swine:

The intestines, vertebrae, the pelvis and breast-bone are examined the same as in cattle. The liver, lung, heart, trachea, and tongue should be examined in the order they are taken from the carcass.

1. The tongue must be examined, the intercostal muscles, the laryngeal muscles (tape worm cysts).

2. Lungs:
   Incision made into them cross-wise (tuberculosis, hog cholera, swine plague).
3. The skin:
   (Red spots, hemorrhagic infraction).
4. The mammary glands:
   (actinomycosis).
5. The feet:
   (Foot and mouth disease).
6. Visible muscles:
   (Hemorrhages, tape worms, calcareous deposits).

IX. CONTAGIOUS DISEASES.

I. ANTHRAX.

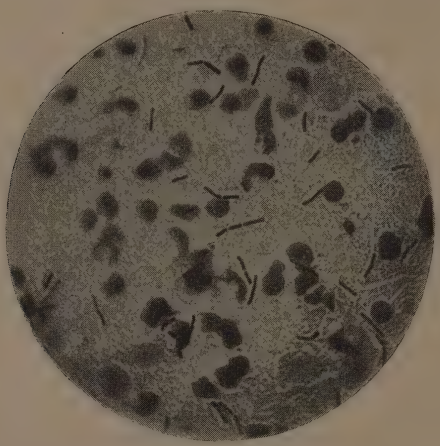
Anthrax is chiefly seen in sheep and cattle, seldom in horses; human beings may contract anthrax. It is caused by the anthrax bacillus.

Symptoms during life are varied. Sheep and cattle generally die suddenly without showing any marked symptoms; but the latter, in a great many instances, show fever and oedematous swelling of the abdomen, shoulders, brisket, or the extremities, as well as hemorrhage from the mouth, nose, anus, vulva and eyelids. The faeces and urine are streaked with blood. Soon after death the animal begins to bloat rapidly and from the natural openings of the body, dark red, tar like blood fluid exudes.

Post-mortem. Under the skin around the various openings of the body and in the muscles, etc., will be found hemorrhages and exudation of a yellowish red substance. The visceral organs are swollen, soft, and the spleen especially is very much enlarged and of a dark red color, soft and rounded at the extremities, the pulp being almost liquid. These lesions are at times more or less pronounced, but the spleen and blood always show characteristic changes.

*Anthrax bacilli almost invariably produce spores when exposed to the free and long continued access of atmospheric air; rarely if the bacilli are entirely submerged in a watery fluid and never when they multiply within the fluids of the body. When, however, anthrax blood escapes from the animal and dries as a crust, either upon the ground or upon the hide of the animal, the bacilli in such blood will have favorable opportunities to spore.

If the bacilli of anthrax or their spores are carried over the surface of wet meadows which become periodically in-



FIG, 8—ANTHRAX.

undated, the moisture and natural warmth which exists before the complete drying off of such a meadow may offer favorable opportunities for the multiplication of the organism in its ordinary vegetating condition, which may be followed as the marsh becomes dry by an abundant formation of spores. Koch has shown **that infusions of herbaceous plants, including the ordinary meadow grasses, offer a favorable medium for

**Mitheilungen aus dem Kaiserlichen Gesundheitsamte, Bd. 1, p. 78.
*Report of the Mycologist, F. D. Chester, Delaware Experiment Station.

the development of the anthrax organism, provided the free vegetable acids in such infusions are first neutralized with an alkaline earth like carbonate of lime. He therefore holds that regions underlaid by limestone and limestone soil offer the most favorable habitats for the development of anthrax. On the other hand he claims that soils containing an excess of organic matter, with therefore a tendency to become acid, fail to support the anthrax organism. The conditions then, according to Koch, necessary for the multiplication of the anthrax bacillus, in soils are, first a certain amount of vegetable matter to furnish nourishment for the germs, and second the presence of enough lime in the soil to neutralize the free vegetable acids as rapidly as they are formed.

The question of spore formation, and their dissemination over land is one of great practical importance because of the great resistance of spores to influences which would quickly kill the bacilli. Whether these spores by retaining their vitality for so long a time can continue to perpetuate the anthrax spores or can remain active in soil or water under the ordinary conditions of the weather is still an unsettled question.

In cold soils and water, excluded from the access of light and free air, they may retain their vitality for a much longer time, even as long as two years."

*"Symptoms of Charbon in the different domestic animals."

In the Ox-tribe.—The acute form, without external localizations (swellings) is the most frequent. It is characterized by high temperature, accelerated pulse (80 to 100 or more per minute), small and imperceptible. The mucous membranes of the nose and mouth are red and often dark colored. There is sometimes a flow of tears from the eyes. Weakness and stupefaction are very pronounced, the appetite is gone, and the animal does not ruminate (chew the cud). The gait is uncertain; trembling of the body, especially the flanks and hind quarters. The expression of the countenance is very dejected.

*Bulletin 44, Second Series, Louisiana Experiment Stations.

Sometimes stupefaction is replaced by rabiform attacks; the patient bellows, scratches the ground, pushes against any obstacle, etc. The gastric trouble includes constipation, slight bloating, abdominal pain, diarrhoea, expulsion of the body matter, etc. The urine often contains blood (hematuria), or is highly stained with the coloring matter of the blood (hemoglobinuria). Blood stained liquids may be emitted from the natural openings, viz: mouth, nostrils, eyes, anus, and vagina. General stupefaction, coma and weakness continue to increase, and death follows from convulsions within from twelve to forty-eight hours.

Charbon tumors are sometimes observed in the ox, as primary accidents, at other times during the course of acute or sub-acute anthrax. They may appear upon the head, neck, chest, shoulders, abdomen, sheath, milk glands, flanks and limbs."

*"Post-mortem examination.—Of a small Jersey cow. Blood was oozing from the anus. The abdominal cavity contained a considerable quantity of blood-stained serum. The blood was very dark, the spleen was enormously enlarged, very dark colored, soft, and the capsule contained ecchymoses. Upon section the blood and pulp flowed freely. The liver was slightly congested, the kidneys deeply reddened and in the bladder there was a small quantity of dark wine colored urine. On the omentum were numerous hyperaemic tufts. The intestines were hyperaemic. There were several ecchymotic areas beneath the pericardium. The lungs were congested. About two liters of the blood were collected from the vena cava. Portions of the spleen and the liver were brought to the laboratory, where a microscopic examination and cultures were made. These revealed the presence of anthrax bacilli."

**"In the Horse or Mule.—Generally speaking, the acute and sub-acute forms are the most common. High fever, quick-

* Dr. V. A. Moore.
** Bulletin 44, Second Series. Louisiana Experiment Station.

ened pulse, small and imperceptible (80 to 100 beats per minute) are the symptoms. The fever is accompanied by chills and convulsive contractions of the muscles. External temperature is irregularly distributed. The mucous membranes of the eyes, nose and mouth, is dark colored, and there is weeping, sometimes from both eyes. The expression is sad. The animal is stupefied, and the gait is staggering. In some cases there is cerebral excitement. Abdominal pain occurs, which may be accompanied by liquid bloody discharge from the bowels. The breathing is quickened and laborious. Death, which is indicated by profuse perspiration, occurs within from six to thirty hours. Recovery is rare. External tumors are generally developed upon the abdomen, chest, inner surface of the limbs, the scrotum, external genitals, etc. This form has a somewhat slower course than the preceding, its average duration being from two to three days. (This is the form which was prevalent amongst the horses and mules in the northern parishes).

"In sheep.—Apoplectiform charbon is the most frequent in sheep. They suddenly present symptoms of apoplexy; they stagger, fall, and are affected with spasms, and convulsions. Black blood escapes by the natural openings. Death occurs in a few minutes.

Acute anthrax has a somewhat longer duration (from half an hour to two hours). It is sometimes marked by excitement, stamping, uncertain gait, etc.; in other cases by congestion of the lungs, quickened respirations and pulse, discoloration of the mucous membranes, bloody or bloody colored urine, bloody discharges from the natural orifices, etc. In some cases anthrax tumors are observed upon the head, throat and mammary glands.

"In the hog.—Enlargements of the throat, intense fever, copious flow of saliva, nausea, vomiting, discoloration of the mucous membrane of the mouth, difficult and quickened breathing, wheezing and rattling respiration, etc., are the symptoms. Death occurs as a rule by asphyxia."

*"THE DISPOSAL OF CHARBONOUS CARCASSES AND OTHER SANITARY AND HYGIENIC MEASURES."

All sanitarians are agreed that cremation or burning is the most effective method of disposing of carcasses of animals that have died of charbon.

When cadavers are buried, unless at a sufficient depth, there is the possibility of anthrax germs being brought up and deposited on the surface of the ground by the earth worm. M. Pasteur has found, in the little rolls of earth deposited above a grave containing a charbonous carcass, the spores or germs of the disease. And these spores may be disseminated by the agency of winds, or more especially by water."

*"The theory of Pasteur that earth worms are capable of bringing buried anthrax spores to the surface and thus infecting grazing ground finds little support according to Koch."

Professor Trasbot also records a remarkable case of infection of the soil by cadavers which were buried in a piece of woods. The ground which was cleared more than ten years after and turned into a meadow had remained infected. I have observed on the other hand, says Professor Trasbot, two examples of infection of the soil by an artificial substance containing blood. Two magnificent flocks of sheep were decimated by anthrax after the use of that manure; in the one case the soil was natural meadow, in the other the soil which was under cultivation with alfalfa.

A very important consideration seems to arise here with regard to the use of dried blood as a fertilizer. Should the blood which the fertilizer contains be contaminated with charbon spores the consequences may be very serious. And it is quite possible that many sporadic outbreaks, which seems unaccountable, arise from this cause.

In disposing of carcasses, every effort should be made to prevent the escape of blood or other fluid or excrement from

*Bulletin 44, Second Series, Louisiana Experiment Station.

the body. In cases where the carcasses have to be hauled some distance for cremation a rough slide of some kind is perhaps the best vehi e, as it can be burned when no longer required.

The most effectually and generally convenient method of burning is to dig a trench, similar to a barbecue trench, with a sufficient number of green poles across it, on which to place the carcass. The firewood can be put below and around, and with the assistance of a little kerosene to start the fire, the operation is performed much more expeditiously than by simply placing the carcass on the surface of the ground.

When an outbreak occurs on a plantation or farm, and the animals are under control, the healthy stock should be removed to fresh surroundings, and the sick allowed to remain where they are (and the attendant should have no intercourse with healthy stock), so as to circumscribe the area of infection. It often happens, however, that the opposite course is pursued, which results in the making of two or more infected places. All manure and litter ought to be gathered together and burned, and the ground disinfected with lime, crude carbolic acid, or some other good disinfectant. A good application for woodwork, such as stables, fences, etc., is lime wash mixed with crude carbolic acid. One pint of the latter to a bucketful of the former. When flies are prevalent, there are agents on the market which prevent them attacking the animals, but a cheap application, and one which we have recommended, is fish-oil emulsion. It may be made as follows:

Take common hard soap, half a pound; fish-oil, two gallons; water, one gallon. Dissolve the soap in the boiling water and while still hot, add the fish-oil, and agitate the whole until the whole is thoroughly mixed.

For use, add to one part of the emulsion 8 to 15 parts of cold water and apply all over the animals. The above are proportions. A large or small quantity can be made as required.

Abattoir inspection. All meat affected with anthrax, as well as animals affected with this disease, must be condemned.

(The carcass and all organs and all parts of the animal should be burned to ensure the destruction of all spores of anthrax).

2. RABIES.

Rabies affects all animals and is transmissable to man. The contagious agent is yet unknown. The infectious matter generally enters the wound made by the bite of a rabid animal, by means of the saliva. The period of incubation varies; in dogs from three to six weeks; cattle and horses from four to eight weeks; pigs from two to three weeks; sheep from three to four weeks. It may be a few days and again it may be several months. The symptoms are most pronounced in dogs. The disease always terminates in death. Two forms are recognized; furious rabies and dumb rabies. The course of the disease is very regular and shows the following successive changes:

Preliminary symptoms. The dog acts unnatural, shows inflammation at the seat of infection, eats and bites at all sorts of objects, such as grass, stones, rags, wood, etc.

In the violent form the dog runs away, has spasms, bites and snaps at all objects, attacks its master and also animals (dogs, horses, cattle, etc.). The voice becomes rough and hoarse and the bark howling. Symptoms of madness change to those of absolute indifference, and the animal stares at one object, or in one direction and occasionally snaps. The dog becomes emaciated and symptoms of madness are noticed. The lower jaw drops or hangs to one side, thick saliva dribbles from the mouth; the animal cannot swallow; it shows a staggering gait, especially in the hind quarters; the tail is limp. Dogs generally die within eight or ten days.

In dumb rabies the violent symptoms are entirely, or to a great extent absent and death follows in two or three days.

Cattle first show symptoms of uneasiness; they butt, stamp their feet, rattle the halter chains, foam at the mouth and bellow in an unnatural tone. Constipation is present and there is a constant pressure on the excrement and sometimes an increased sexual instinct. The animal becomes emaciated;

shows symptoms of paralysis and dies within three or four days. In horses the symptoms are the same as in cattle, with the addition of colic, twitching of the muscles and paralysis, the animal dying in from four to six days. Pigs likewise make very unusual sounds. They very often attack man or snap at him, as well as animals and objects, and die in one or two days. Sheep have similar symptoms and die in three or four days.

In the diagnosis of rabies the symptoms during life are much more important than the post-mortem lesions. Animals that are placed in strange stables, or separated from their companions often show all the symptoms of fright and uneasiness. The sexual excitement in the female is similar to that of oestrum, in the latter the sexual organs are swollen. The cerebral excitement observed in rabies is like that seen in diseases of the brain. The diagnosis for rabies becomes much more certain when symptoms of paralysis are present and when there is an assurance that the animal has been bitten, or exposed to a rabid animal.

The post-mortem lesions are very meager. The most pronounced are the intense inflammation of the mucous membrane of the larynx and pharynx; the presence of undigested foreign bodies in the stomach; inflammation and swelling of the mucous membrane of the stomach and the thick liquid, not coagulated, condition of the blood.

Abattoir inspection. The flesh of rabid or suspected rabid animals must be regarded as unwholesome and should be condemned.

(Rabies of food producing animals is more important than of the dog to the meat inspector, and could be given more prominence with advantage. A. T. P).

3. GLANDERS.

Glanders is common to all solipeds (horse, ass and mule), but it can be transmitted to the goat, dog, cat, and also to man. Cattle are not known to contract glanders. The disease is

caused by the glanders bacillus or bacillus Malleus. During life two forms of glanders are distinguished; nasal glanders and skin glanders (farcy).

1. In NASAL GLANDERS there is a greenish yellow, watery, slightly slimy discharge which becomes thick, tough, sticky, and forms into small crusts which adhere to the nostrils. As a rule the discharge is on one side. The inter-maxillary lymphatic glands are swollen, hard and knotty, and firmly adherent by connective tissue to the skin and maxilla, hence but slightly movable. The mucous membrane of the nose is at first somewhat inflamed, then small hard yellowish nodules are formed, which are of a lighter color than the surroundings. These nodules are usually found in groups and their centers quickly degenerate and form ulcers having zig-zag swollen edges and a dirty grayish-yellow background. The ulcers are covered with a sticky fluid which often forms into crusts. These ulcers may heal and leave a characteristic scar.

2. FARCY (cutaneous glanders). In farcy there may be found on the legs, shoulders, abdomen, breast, sides, back and head, growths or boils, varying in size from a pea to a walnut, most of which suppurate and leave an ulcer with a narrow opening and which discharge a dark gray or yellowish red opaque fluid that often dries into crusts. The lymphatic vessels are swollen and red and in many places along their course ulcers are seen. The lymphatic glands are also swollen and hardened. These pathological changes are at times more marked than at others and then disappear. The extremities alternately swell and as a consequence lameness may result. The skin on the extremities may also become greatly thickened. Animals affected with glanders emaciate in time (coarse hair and hard skin), show occasional hemorrhages from the nose, cough, breath with difficulty, and the extremities, abdomen, breast, different joints, penis, testicles, become swollen. To diagnose glanders during the life of the animal, one must differentiate distemper, inflammation of the mucous membrane

of the nose and larynx, injuries, pathological growths, parasites on the mucous membrane of the nose, inflammation of the lymphatic vessels, disease of the skin, etc. A positive diagnosis of glanders can only be made by prolonged observation or by post-mortem. (Microscopic examination and malleine test are now accepted as reliable. A. T. P.). The above described symptoms suffice for a positive diagnosis of a suspected case.

Post-mortem examinations reveal principally pathological changes of the mucous membrane of the nose, lungs, skin and sub-cutis; other organs being seldom affected. To examine the mucous membrane of the nose, saw the head through lengthwise, in order to see the pathological changes as above described, which may also extend to the larynx and trachea. In the lungs may be found very small nodules or tubercules, about the size of a pea, which are circumscribed by a red zone. These nodules may be degenerated in the center, being yellow liquid pus, caseated or calcified. Finally an indurated capsule may be found covering one or a group of these growths, or these small abscesses may form a large abscess. Besides these, tumors, which are of a grayish-white firm nature, may be found in the lungs, varying in size, sometimes as large as a child's head. In the skin are found the above described abscesses, which may extend under the skin and between the muscles. The lymphatic glands of the affected parts are always swollen and contain a number of suppurating points. In acute glanders there is found in addition to the above described symptoms a general disease terminating in degeneration and extensive necrosis of the various parts (lung, skin and nasal membranes).

Abattoir inspection. The carcass of a glandered animal is unwholesome as food and should be condemned.

4. FOOT AND MOUTH DISEASE.

Foot and mouth disease occurs only in animals with divided hoofs (cattle, sheep, goats, pigs); but man, especially small children, may become infected by partaking of raw milk (also

butter and cheese) from affected animals.

The manner of infection of animals is not known. The virus is contained in vesicular eruptions, abscesses, saliva, milk, urine, faeces, as well as in the exhaled air. The period of incubation varies from five to eight days, very often only twenty-four hours (especially in transported animals). The disease first makes its appearance with a vesicular eruption around the hoof and on the mucous membrane of the mouth. In the mouth cavity, on the lips and gums, especially on the borders and tip of the tongue and on the cheeks are found eruptions, varying from one-half to one inch in diameter, which have a yellowish gray color. They are markedly raised and contain a clear yellowish fluid, which becomes turbid. The eruptions burst and leave red sensitive wounds, which have circular white edges (necrosed epithelium). (See Figure 9). Around the coronet, in the interdigital space and on the plantar cushions similar eruptions are found. Very often these eruptions occur on the udder, especially on the teats, and on the vulva and vagina, or at the base of the horns. They heal within eight to fourteen days and the animals recover. In some cases the eruptions do not heal very rapidly, especially on the feet, but become large, deep-seated wounds, which extend to the bones and joints and cause a general disorder and sometimes the death of the animal. Cattle generally have foot and mouth eruptions, while pigs and sheep have eruptions on the feet only. Before the appearance of the eruptions, fever is noticed and in very rare cases sudden death results. In cattle a tough transparent saliva dropping from the mouth, with lameness in one or all limbs is first noticed. On the appearance of these symptoms a thorough examination of the mouth and hoofs is very essential. Sheep also first show symptoms of lameness. The eruptions occur around the coronet and in the interdigital spaces and on the heels. They can very easily be seen on sheep by separating the toes. In so doing the eruptions burst and a clear white fluid exudes. Eruptions in the mouth are seldom found. The

BOVINE TONGUE AFFECTED WITH FOOT AND MOUTH DISEASE.

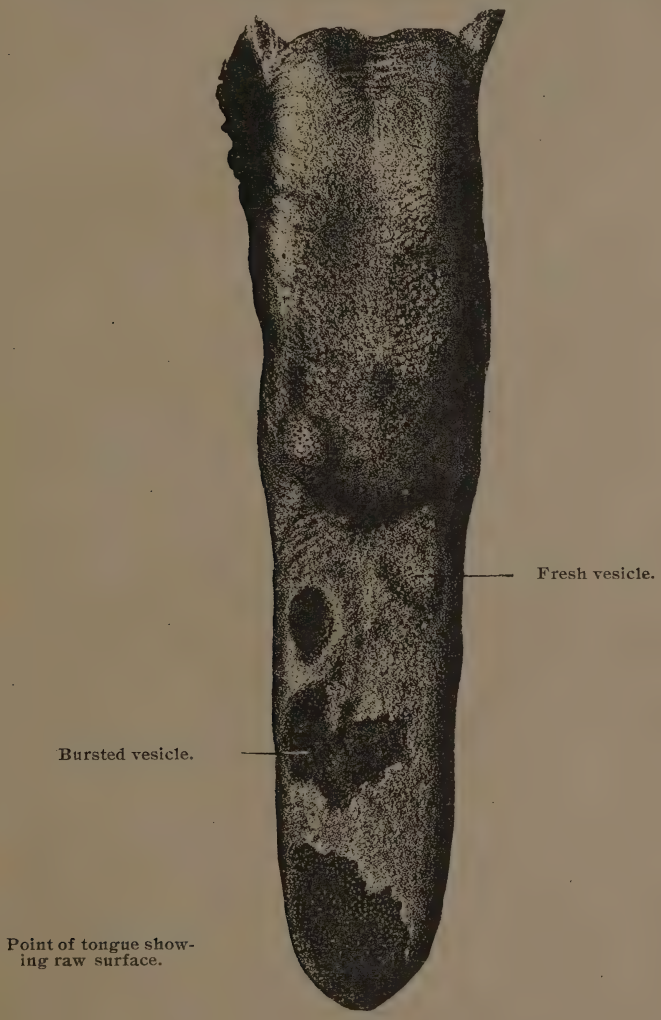


FIG. 9.

first symptoms in pigs are violent squealing and lameness. The vesicular eruptions on the feet are quite large and very often the entire skin on the ball of the foot forms one large eruption. It bleeds very easily and very often the hoof comes off. The mouth is seldom affected, but in very severe cases not only the mouth, but also the entire snout is affected, as well as the outer skin above the tarsus, which may form one large vesicle.

Differentiation. Foot and mouth disease may be mistaken for various other diseases. In cattle especially, injuries have caused lameness and there are anomalies of the teeth and jaws which might be mistaken for foot and mouth disease. Foot and mouth disease in sheep must be distinguished from malignant diseases of the hoof, in which case the soles of the feet are inflamed and very sensitive. Lastly all animals that are transported suffer injuries of the coronet and heels which make them lame; but foot and mouth disease is indicated by an eruption on the skin immediately above the hoof, which has a rosy-red background, and after bursting is circumscribed by a white zone. In this disease the lesions are superficial, while in other diseases the lesions are more deep-seated and the outward appearances indicate swellings of the entire foot. It must also be noted that in pigs which have been slaughtered the skin on the feet (heels and coronet), as well as on the lips, snout and tongue, after being scalded, can be peeled off, and the characteristic red spots found in foot and mouth disease can be removed.

Abattoir inspection. The carcass and organs of animals affected with foot and mouth disease are used for consumption (in Germany), excepting the parts affected with eruptions, such as the mouth and feet, which are condemned.

5. PLEURO-PNEUMONIA.

Pleuro-pneumonia occurs only in cattle and is native in some localities (Province of Saxony). It has not occurred in America since 1892, when it was effectually stamped out by Dr. D. E.

Salmon, Chief of the Bureau of Animal Industry. The specific germ causing this disease has not been determined. The period of incubation varies from three to six weeks. The symtoms are not very pronounced. In acute cases they resemble those of inflammation of the pleura (difficult breathing, coughing, discharge from the nose, fever). In chronic cases there are very often no symptoms. Therefore, during life pleuro-pneumonia can be diagnosed only when one is positive that the animal has been exposed or infected. The post-mortem appearance, on the contrary, is very marked. Usually only the left lung is affected. It is enlarged and solid and does not make a crackling noise when an incision is made through it, and will not float on water. The connective tissue between the lobes is formed into yellowish-gray in the center, or into grayish-white strata. That part of the lung lying between is gray in the center, yellow further out, and red on the border, thus giving the lung a mottled appearance. The diseased portion may be encapsuled. The pleura has a soft, movable, skin-like covering. It must be borne in mind that in cattle, tuberculosis may be present with pleuro-pneumonia.

Abattoir inspection. Pleuro-pneumonia is not transmissible to man. The meat and organs are, therefore, not unwholesome, but the lungs must in all instances be destroyed so that the disease cannot be spread by them. In the United States the carcasses of animals having pleuro-pneumonia are always condemned.

6. SHEEP POX.

Pox is considered an epidemic in sheep. The germ of infection is not known. The period of incubation varies from four to seven days. The symptoms and the course of the disease are, as a rule, of a regular type. Fever is noticed. On the parts thinly covered with wool, as around the eyes, nose, mouth, breast, abdomen, and on the inner surface of the thigh, small red papules form, which become lighter colored at the top in about five days, then change into a vesicle with an in-

dented center, the contents of which is at first clear but gradually becomes turbid. During this time the general condition of the animal is very much impaired (fever, inflammation of the visible mucous membranes, swelling of the affected parts). The pox mature within fourteen days; then begin to dry, become yellow, and later dark brown, forming a scab; the scab loosens and leaves a shining white, or red scar. The course of the disease is of three weeks duration. Complication may set in when several pox unite and form large abscesses which terminate in necrosis of a large portion of the skin and general pyaemia. Malignant pox is indicated by a very putrid odor.

Pox is found in OTHER ANIMALS, but has nothing identical with sheep pox. The disease is local and does not affect the general condition of the animal. In cattle the eruptions are found on the teats and udder; in horses on the pastern joints; in swine on the entire surface of the skin. (This disease in swine is considered identical with small-pox in man by some writers. A. T. P.)

Abattoir inspection. Sheep pox is not transmissible to man. The flesh and organs of sheep which are not affected with fever at time of slaughter are used for consumption (in Europe). If fever exists they are condemned.

It is very important for the meat inspector to know that cattle which are used to furnish animal lymph to vaccinate human beings, must be free from fever when ready for slaughter. If fever is present (102° F.) or the vaccinated parts are swollen or inflamed the carcass must be condemned.

7. EQUINE SYPHILIS AND COITAL EXANTHEMA IN HORSES AND CATTLE.

1. Equine syphilis only appears in horses and is transmitted by coition. The virus is yet unknown. The period of incubation varies from eight days to two months.

Symptoms: In stallions the penis, testicles and scrotum become swollen and are covered with dark red spots, pimples and

ulcers. In mares the vulva, vagina and urethra are similarly affected. The corresponding glands are swollen and sensitive. Individual ulcers heal and leave a scar and new ones form again. The animal urinates very often and shows an increased sexual instinct. Mares have a nut-brown colored discharge from the vagina which is mixed with dark red lumps. The general symptoms, which often first make their appearance after the ulcers have healed, are exhaustion, weakness, emaciation, partial paralysis of the hind quarters, also of the ears, lips, etc. Round, sharply outlined, unpigmented patches appear on the body, these being about the size of a dollar. They are especially found on the flanks, neck, shoulder, breast and abdomen. The disease generally ends in death.

2. Coital exanthema is also communicated by coition. The infectious agent is not known. The period of incubation is from three to six days. An eruption forms on the genital organs, which spreads to the neighboring skin, forms small nodules and pustules filled with a clear reddish-yellow fluid, and bursts, leaving a flat ulcer covered with a dark brown crust. It heals in about three or four weeks, leaving a smooth white scar. During the disease there will be frequent urination and increased genetic instinct. In some instances inflammatory, suppurating ulcers form, accompanied by high fever and general disturbance. The disease may terminate in death.

Abattoir inspection. These two diseases are not transmissible to man, so the flesh is passed for consumption. If pus-producing ulcers appear on the sexual organs with a general disturbance, the flesh is injurious to health.

8. SCAB. (Mange).

Scab is found in all domestic animals and is caused by a small round parasite clearly visible only with a pocket microscope, or with a compound microscope. They inhabit the skin and by continued irritation cause it to become inflamed. The disease is transmissible by migration of mites from one animal to

another. There are three species of these mites and distinct varieties inhabit special animals. It is important for the meat inspector (in Europe) to be acquainted with this disease because it must be reported.

(a) SCAB IN HORSES, MULES, ETC.

On these animals there are two kinds of scab to differentiate:

1. SCAB CAUSED BY SARCOPTES manifests itself on the head, neck, shoulder, breast, and in the saddle region. There is an itching sensation especially when the animal is overheated and warm, and when rubbed it champers its jaws. Eruptions appear on the skin; then the hair falls out, or sticks together; later on crusts and scales form; the skin thickens and lies in folds with fissures from which bloody serum or pus exudes. The diagnosis is based on the intense itching and scratching and the presence of the mites.

2. DERMATOCOPTES OR SUCKING MITE. Scab caused by the sucking mite appears on the more protected parts of the body as at the base of the mane, on the top of the head, in the throat, on the scrotum, udder, and on the inner side of the thighs. The pathological changes are similar to those mentioned above. The scabs and crusts become very thick. The diagnosis is based upon the characteristic location and the presence of the mites.

(b) SHEEP SCAB.

Sheep scab affects only parts thickly covered with wool, while the unprotected parts (head, limbs) remain unmolested. It usually makes its appearance upon the back or rump and then spreads over the entire body. The animals experience a strong itching sensation, which they try to relieve by rubbing and scratching. They make known their uneasiness by rubbing their heads or hind feet against objects and champ their jaws. The fleece is uneven; lighter colored tufts project above the surface.

On closer examination yellowish scales, nodules, pustules, and yellowish-brown scales are found. If the disease is of long duration animals emaciate very rapidly and become anaemic and dropsical. The diagnosis is based on the intense itching sensation, the changes of the fleece and skin, and especially on the presence of the mites.

Common form. Caused by Psoroptes communis, which can be seen quite readily by the eye, by placing scab on black paper, and placing in the sun, when the mites can be seen crawling about. They are about 1-40 to 1-50 in. long.

There are also three other forms, viz:

(a) Sarcoptes scabiei, var. ovis (head scab or black muzzle), which affects the head.

(b) Chorioptes communis, var. ovis. (foot scab). This form affects the limbs, scrotum and udder.

(c) Demodex folliculorum, var. ovis. This form is very rare, affecting the eyelids.

Abattoir inspection. The flesh of animals affected with scab is allowed to be sold, provided the animals are not emaciated and the flesh not watery. If these conditions exist it is then stamped as second class.

(In the United States all sheep affected with scab are condemned when greatly emaciated. For interstate purposes they are dipped at the different stock yards through which they pass. A. T. P.)

9. RINDERPEST.

Rinderpest occurs in cattle, but can be transmitted to other ruminants. The infectious agent is not known. The period of incubation varies from three to six days. Rinderpest is one of the most dangerous and the most rapidly infectious of all cattle disease. It is most prevalent in Russia and is at times introduced into Germany, where it causes a great devastation. (It is also prevalent in South Africa. A. T. P.)

Symptoms: The symptoms are high fever and general acute gastro-enteritis. The animals refuse feed, rumination is

suspended, and they are very thirsty. In the early stages constipation exists, which is followed by dysentery. The visible mucous membranes (nose, mouth, eyes, anus and vagina) first show extensive red patches, then a watery slimy discharge. Later on these places have loose grayish white coverings which slough off, leaving ulcerating surfaces. The diarrhoea becomes more intense, the animals become emaciated, lose strength and the discharges from the natural openings of the body contain putrid pus of a nut-brown color. Death ensues in from four to seven days. In Germany the disease is nearly always fatal; in Russia the fatality is about 50 per cent.

Post-mortem examination reveals the mucous membrane of the stomach and intestines swollen and covered with a tenacious yellowish bloody mucus. In advanced stages it shows golden-brown ulcers. The glands of the intestines are especially affected and ulcerated. The omasum is empty and the third stomach is mostly filled with dry hard food.

Abattoir inspection. The meat is condemned to avoid the spread of the disease. (This disease is unknown in America. A. T. P.)

10. TEXAS FEVER.

*The disease known as "Texas Fever" or "Southern Fever" may be recognized in the living animal which has been driven to the abattoirs for slaughter, if it is allowed to become quiet, for as soon as the excitement of the drive is past the sick animal assumes a characteristic position. The back is arched, the limbs are spread apart to enable it to stand steadily, the head is dropped low, the ears fall downward and forward, or the animal may lie down, in which case the head is carried around to the flank, as in parturient apoplexy. If a thermometer be employed, it is usually found that the rectal temperature is 103 degrees to 106 degrees F. Should the animal void urine, the dark brown color will be very noticeable, and when the sick animal is made to walk, after a period of rest, a staggering gait will attract attention. If it be docile an examination of the vis-

*Pro- of U. S. Vet. Assn. 98 Page 104ss.

ible mucous membranes may be made, but in range cattle the prudent inspector will dispense with the information to be so acquired, for animals sick with Texas fever are more excitable and vicious than healthy cattle. The presence of ticks (see plates I-V) on the escutcheon, thighs, flanks, and elsewhere confirm the diagnosis.

When an animal sick with Texas fever is slaughtered, the examiner will find the spleen greatly enlarged, its capsule easily torn, and the substance of the gland quite black and very soft, sometimes partly liquid, so that considerable of the spleen mass will gravitate to either end of the capsule if it be suspended by the other end. The liver is much enlarged, and changed from a brownish to a mahogany color, also somewhat mottled on cut surface due to being irregularly stained with coloring matter from the blood. The gall bladder is distended with a very dark, tarry, viscid bile, in which is suspended a quantity of yellow flakes, which will deposit upon standing. The urine contained in the bladder has a dark red to port wine color, and the kidneys will be congested. Other visceral organs present no characteristic lesions. In some carcasses the tissues have a yellowish tinge and the fat a bright lemon-yellow shade. In other carcasses the color of the flesh is normal, but the cancellous structure of the bones is stained dark like the urine.

The foregoing presents the principal ante-mortem symptoms and the post-mortem lesions of an acute disease fully developed. In this type of case an inspector would not be in doubt as to whether or not an animal is diseased, nor as to what disease it is, neither would he hesitate concerning its condemnation. In the same bunch of cattle in which this typical case is found, there will probably be others in which this malady is just beginning to develop or is partly developed. The structural changes in the spleen and liver are not so marked, perhaps scarcely discernible. The disintegration of blood corpuscles may not be sufficient to stain the urine highly. Or the case may be of a very rapid type. It will tax the judgment of the inspector to rightly determine whether the animal is infected;

whether or not the disease is sufficiently developed to render the flesh unwholesome, this disease not being communicable to man.

EXPLANATION OF PLATES.

Stages in Development of Cattle Tick (Texas Fever).

Plates by H. A. Morgan.

Plate I.

Fig. 1. Adult female ovipositing; natural size to the right.

Fig. 2. Eggs slightly enlarged.

Fig. 3. Egg five days previous to hatching (greatly enlarged).

Fig. 4. Egg immediately before hatching (greatly enlarged).

Fig. 5. Mussel-like egg shell (greatly enlarged).

Fig. 6. Seed tick (greatly enlarged).

Plate II.

Fig. 1. Bunches of seed ticks upon the glass cylinder of the breeding cage.

Fig. 2. Bunch of seed ticks upon the distal portion of a leaf.

Plate III.

Fig. 1. Side view of distal portion of leg of seed tick (greatly enlarged).

Fig. 2. Distal portion of fore leg of seed tick (greatly enlarged).

Fig. 3. Distal portion of one of the hind legs (greatly enlarged).

Figs. 2 and 3 illustrate size of the front pair of legs of seed tick as compared with two hind pairs.

Plate IV.

Fig. 1. Mouth parts of seed tick (the clear bean-shaped spots at the base should be omitted) much enlarged.*

* Not quite correct (H. A. M.)

PLATE 1.

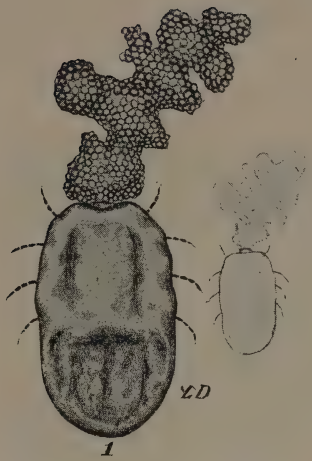
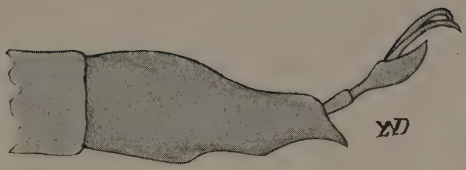


PLATE 2.

FIG. 1.

FIG. 2.

PLATE 3.



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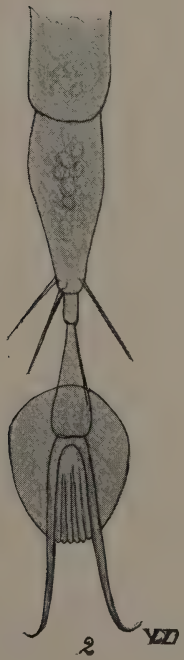

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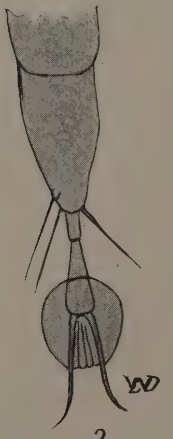

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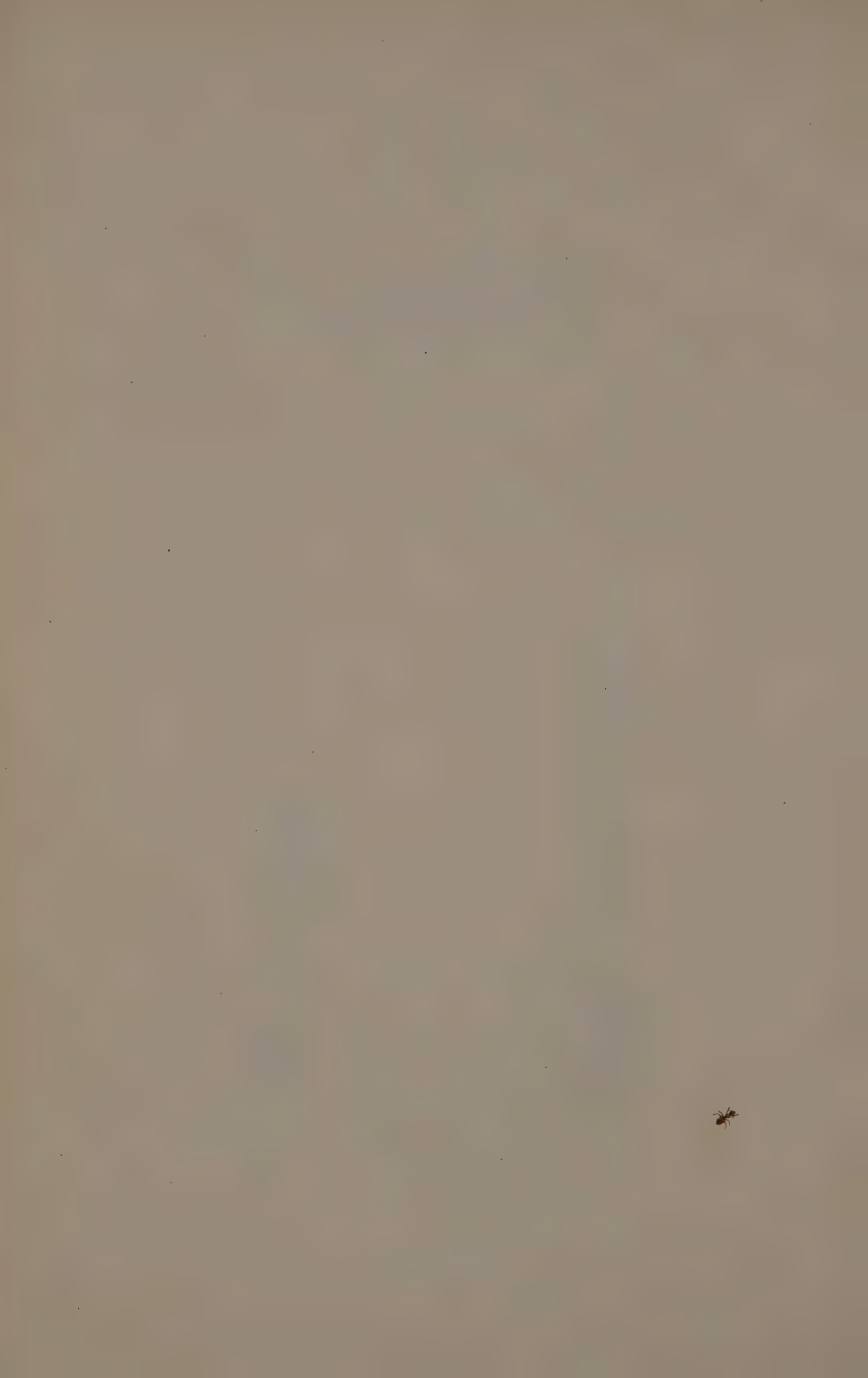

Fig. 2. First stage of tick just previous to second molt (greatly enlarged).

Fig. 3. Second stage of tick just previous to first molt (greatly enlarged).

Fig. 4. Second stage of tick just previous to second molt (greatly enlarged).

Fig. 5. Male just after second molt (greatly enlarged).

Fig. 6. Female just after second molt (greatly enlarged).

Plate V.

Fig. 1. Dorsal view of fully engorged female (adult); natural size to the right.

Fig. 2. Ventral view of fully engorged female (adult); natural size to the right.

Fig. 3. Ventral view of male, full grown (greatly enlarged).

Fig. 4. Dorsal view of the male, full grown (greatly enlarged).

Fig. 5. Tick molting second time (greatly enlarged).

X. CONTAGIOUS DISEASES.—PART 2.

1. SWINE PLAGUE.

Swine plague appears chiefly among pure breeds. It is caused by the plague bacillus. The period of incubation is from three to four days.

Symptoms: The animals are dull, refuse feed, hide under litter, sway when walking and have a distressed look. In a few hours red spots appear on the more delicate surfaces of the skin (on the inner surface of the thigh, under the breast, genital organs, neck and ears). These spots enlarge and often the entire body has a copper or reddish-brown color. Death ensues in from twenty-four to forty-eight hours. The few that survive have contracted heart disease, emaciate and remain stiff.

Post-mortem reveals in addition to the dark red color of the skin, the same pathological changes found in septicaemia (see page 157). The spleen is swollen and bluish red; the liver is soft and bloody; the kidney enlarged and scattered with numerous petechia. The mucous membrane of the stomach and intestines is highly inflamed and swollen; the pleura, peritoneum and especially the auricles of the heart contain numerous petechia and the heart is soft and has a parboiled appearance. The marked red color of the skin must not be mistaken for other discoloration of the skin: First, as a result of a blow, or the like, the coloration is localized. Second, in pigs, which are exposed to extreme heat or cold, or which were not entirely free from blood when put into the scalding vat, the discoloration is dotted, lighter, and not confined to the sensitive parts of the skin. Third, in nettle fever the petechiae are dark red and very distinct, quite large and spread over a large surface: Fourth, erysipelas is confined to one side of the head.

Abattoir inspection. All meat affected with this disease should be condemned. (See page 134.)

2. INFECTIOUS PNEUMONIA.

Infectious pneumonia in pigs (this and epizootic disease of wild animals are probably one and the same disease, see page 135) is caused by bacteria. It is more easily transmitted and is more dangerous than swine plague, but is not so prevalent. The period of incubation is from five to twenty days.

Symptoms: The skin becomes light red, especially on the abdomen, neck and breast. The animal is dull, shows symptoms of difficult breathing, coughs, and death ensues quickly. In some instances it is chronic and of long duration. The swine which recover remain emaciated, cough, and often have swollen joints.

Post-mortem reveals the most pronounced pathological changes in the lungs and large intestines. Numerous firm

PLATE 4.

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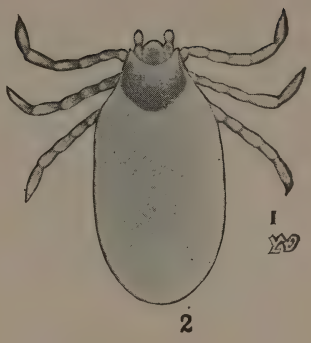

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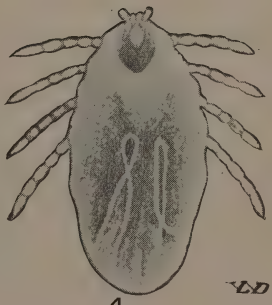

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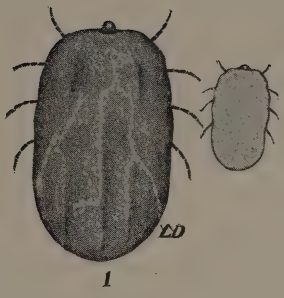
PLATE 5.



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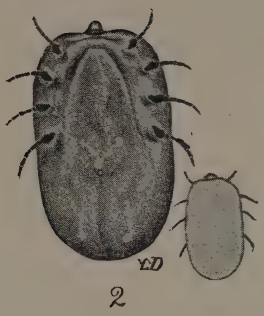

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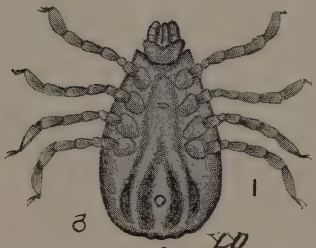

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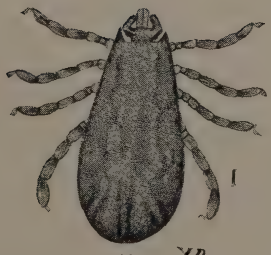


4

5

grayish-red nodules are found in the lungs which are solid and will not float on water. In the centers of these nodules are yellow spots which are distinctly circumscribed and about the size of a coarse grain of sand. The lungs adhere to the wall of the thorax and pericardium, or are partly grown together; the pleura is devoid of its gloss and smooth consistency, but on the contrary is covered with numerous little yellow red abscesses. On the mucous membrane of the intestines are found flat yellowish ulcers, or the entire organ shows gastro enteritis. If an animal recovers from this disease, these pathological changes generally remain the same and the lungs and pericardium adhere to the chest wall, and in the lungs will be found caseous degeneration. The lymphatic glands rarely become caseous. Besides this there may be caseous degeneration of the bones and joints (see page 156). The mucous membrane of the intestines is thickened and calcified and the pancreas hardened.

Abattoir inspection. Animals affected with this disease should be condemned (see page 134).

3. HOG CHOLERA.

This disease has just lately made its appearance in Germany, but has been quite prevalent in America since 1877. As a rule, it affects young animals up to four months old. The cause of hog cholera is a small bacillus. The period of incubation is from five to twenty days.

Symptoms: Great weakness, drowsiness, constipation, followed by diarrhoea, finally paralysis, ending in death within two to five days. Rosy spots are seen on the nose, ears, anus, and on the inside of the thighs. Animals that survive emaciate and die after a lingering illness.

Post-mortem examination reveals the most important changes in the large intestines. The mucous membrane of the large and small intestines is red and swollen and dotted with dirty yellow and black ulcers which are so deep that they may

penetrate the walls of the intestines (see plate 6). The pancreas is swollen and somewhat caseous. Ulcers are found on the tongue and larynx. In some cases the lungs are likewise inflamed. It is very difficult for the meat inspector to make a positive diagnosis of the three different swine diseases which I have just described, but they can very easily be distinguished when one bears in mind that in swine plague the pathological changes in the organs are almost uniform, while in infectious pneumonia they are principally in the lungs and in hog cholera in the intestines. Chronic cases of infectious pneumonia and hog cholera are distinguished from tuberculosis by the fact that the diphtheritic patches in the intestines do not calcify, but become caseated on the edges, dry and brittle in the center, while ulcers of tuberculosis calcify.

Abattoir inspection. The flesh of animals affected with either of the three before described diseases may be used for food if the animals were slaughtered on the premises in which the infection took place. Diseased animals are not allowed to be taken on public highways or transported to abattoirs, and if the flesh is taken off of the diseased premises it must previously have been cooked in order to avoid the spread of these diseases. (The flesh of animals affected with any of the three mentioned diseases is condemned by American meat inspectors and is prohibited to be used for consumption. Meat infected with these diseases might cause serious disorders in human beings (such as diarrhoea) and is unfit for human food. A. T. P.)

4. BLACKLEG.

Blackleg is chiefly found in cattle, but can be transmitted to sheep, goats and horses. It is found only in certain districts, mostly on the plains (known as blackleg districts) and affects cattle from one to four years old. It is caused by the blackleg bacillus entering the skin through an abrasion. The period of incubation is about two days.

Symptoms: Fever prevails and the disease generally ter-

minates in sudden death. Swellings appear under the skin similar to those of anthrax, but contain gas and make a crackling noise when stroked.

The post-mortem lesions are similar to those of anthrax, but the swellings creak when rubbed or cut, and the spleen is not enlarged.

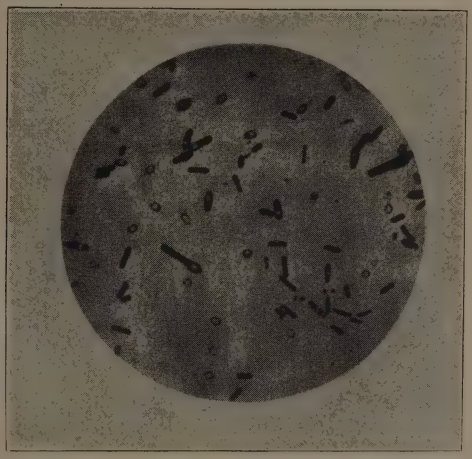


FIG. 10—BLACK-LEG.

Abattoir inspection. Meat affected with blackleg is not considered injurious, but because the disease is contagious and resembles anthrax the sanitary police condemn all such meat. (In America the meat inspector seldom finds a case. A. T. P.)

5. EPIZOOTIC DISEASES OF WILD ANIMALS.

The animals chiefly affected with this disease are stags, oxen and wild boars, but it can also be transmitted to horses and swine. It was first observed in Bavaria, Cassle and Posen. The cause of this disease is a small bacteria which enters the body through the lungs, intestines, or through an abrasion.

Symptoms: Large, inflamed, very sensitive and firm swellings appear on the neck and head, accompanied with fever and

difficult deglutition, or the symptoms are similar to those of acute gastro enteritis, or inflammation of the lungs. Death follows in from twelve to thirty-six hours.

The swellings and post-mortem lesions show a similarity to those of anthrax and blackleg, but do not make the crackling noise of the latter and the blood and spleen are normal The former are similar to those of pleuro-pneumonia.

Abattoir inspection. Meat of animals affected with this disease is not injurious to health, but the disease is considered a form of anthrax, and is treated likewise.

6. MALIGNANT OEDEMA.

This disease is caused by a bacillus which lives in the upper strata of the earth and which may cause disease when it enters the subcutaneous tissues. It quickly causes swellings which crackle under the hand. The neighboring muscles are covered by a briny yellow, or reddish substance. The small intestine is very often inflamed, but other organs are not changed. Death follows in from twenty-four to forty-eight hours.

Abattoir inspection. If marked pathological changes are noticed in the various organs the meat is unfit for use, but it may be used for consumption if absent.

7. MALIGNANT CATARRHAL FEVER OF CATTLE.

This infectious disease is seen exclusively in cattle. The agent of infection is not known. The period of incubation is from three to four weeks.

Symptoms: The first symptoms are high fever and physical depression; later on, spasms and delirium (cerebral hyperaemia). The cornea becomes turbid, the urine very often contains blood, and the other symptoms closely resemble those of rinderpest. The course is either very short (three to four days) or the disease may last three or four weeks, during which time the animal may improve or deteriorate. More than 50 per cent of the cases are fatal. Catarrhal fever can be

distinguished from rinderpest by the affection of the eye and, as a rule, the mucous membrane of the nose and larynx are highly inflamed, and, in fact, the entire organs of respiration, while in rinderpest the eyes are not affected, but the mucous membranes of the mouth, stomach and intestinal tract are affected.

Abattoir inspection. The disease cannot be transmitted to man. If it is of long standing and the animals emaciated, the flesh is not given for public use.

XI. DISEASES CAUSED BY VEGETABLE PARASITES.

(Infectious diseases).

I. TUBERCULOSIS.

This disease in cattle and pigs is of great importance to the meat inspector. It is seen in man, cattle, swine, poultry, and very often in horses, dogs, cats and sheep, but very seldom in goats. In the public abattoirs 26 per cent of all slaughtered cattle and 1½ to 2 per cent of pigs are found tuberculous. In cattle, tuberculosis is chiefly found in cows (about 50 per cent). Old animals are oftener diseased than young ones. It is estimated that of old dairy cows about 75 per cent are affected with tuberculosis, but it is not so prevalent in younger animals and is very seldom found in calves (3 to 8 per cent). In sheep there is found almost the same per cent as in calves. The cause of tuberculosis is the tubercle bacillus which is found in tubercles, milk, and exhaled air of diseased animals. Infection takes place through the lungs or alimentary canal, seldom through the genital organs, udder or abraded skin. The intestines first become affected in pigs and young animals, and the lungs in old cattle. By invasion of the bacilli, small gray nodules are formed in the invaded tissue. These nodules multiply and form larger tubercles, which are at first gray, but may become yellow and caseous from the center outward.

Calcified tubercles are hard and crackle when incised. Tuberculosis spreads through the system namely: First, by the lymph; second, by invasion of surrounding parts; third, by the blood.

1. Propagation by the lymph. The lymphatic glands which belong to affected parts are always tuberculous and become caseous, calcified or degenerated. This condition is very important to meat inspectors. It is a waste of time to examine each organ in which the tubercles are sometimes difficult to find or absent, when by incision, the presence of tubercles in the lymphatic glands is convincing. If the lymphatic glands are free from tubercles the organ is the same and vice versa. For instance, if the mesenteric glands are tubercular the intestines are sure to be so; if the mediastinal glands are tubercular the lungs are sure to be the same.

2. Dissemination to the neighboring parts. Tuberculosis spreads from the lungs to the pleura. In cattle the pleura often shows numerous nodules and tubercles which are sometimes as large as a man's fist and which are extensively calcified. From the pleura the disease spreads to the peritoneum by means of the small openings in the diaphragm through which the bacilli pass. From here it spreads rapidly over the entire peritoneum and also over the serous covering of the intestines. From the serous covering of the organs it does not spread to the organ proper, but vice versa, from the organ to the serous covering. Infection of the peritoneum may also originate from the intestines in which case the tubercle bacilli of the mucous membrane penetrate the muscles, or pass from the pancreas to the peritoneum. Tuberculosis of the intestines (swine) is caused by partaking of tubercular food (milk) or by deglutition of tuberculous expectoration. Therefore, tuberculosis may extend from the thoracic to the abdominal cavity either directly through the diaphragm or by deglutition of expectoration.

3. Dissemination through the blood. It is caused by tuberculous nodules degenerating and discharging or sloughing

into a vein. The tuberculous matter enters the vein and by the blood it is carried to all parts of the body. The large lymphatic vessels which terminate directly into the veins may be affected and thus contaminate the blood. By the blood tubercular matter can be taken to all parts of the body, lungs, brain, kidney, spleen, udder, bones, etc. Wherever tuberculous matter is deposited new nodules or tubercles are formed. A new invasion of tuberculous matter through the blood is characterized by the nodules being small and the surrounding parts showing signs of hemorrhage, inflammation and swelling. Sometimes invasion is so limited that only a few nodules are found in some organs, while at other times they may be very numerous. It is very important for the meat inspector to know through which part of the circulation the invasion took place. If the invasion took place through the blood vessels lying between the intestines and liver (the portal vein), the tuberculous matter will not reach the heart and cannot be taken up by the arteries and scattered through the body, but congregate in the liver (see page 24), while the remaining circulation and the entire system is spared. This is also the case if the invasion has taken place through the small blood vessels whereby the infectious matter will be deposited in the lungs, but on the contrary, when invasion occurs through the large blood vessels, the tuberculous matter can be distributed through the entire body and cause a general tuberculosis. The flesh can only become tuberculous and unfit for use when the large blood vessels are invaded with tubercular matter, but this is not to be taken for granted in every case. Even if an invasion has taken place in the large blood vessels, as a rule, only the individual organs become affected while the flesh remains free from invasion. Flesh free from tuberculous matter can be detected when the nodules are found in individual organs and when the axillary gland does not show signs of tuberculous lesions. If the nodules produced by the bacilli which have been carried to the different organs by the circulation are still fresh, and even if the lym-

phatic glands are not affected, there may be a possibility that the flesh is diseased. If, on the contrary, the invasion has not taken place through the large blood vessels, but through the small or portal vessels by dissemination direct or by the lymphatic system, the meat is not considered infectious or unwholesome.

(a) Tuberculosis in cattle. The symptoms during life are not very pronounced. In the first stages the animal seems apparently healthy. If the disease has involved a large part of the lungs there will be signs of difficult respiration, coughing or solidification of the affected parts. Later on the animal becomes more and more emaciated, the skin becomes thick and hard, the hair rough, the eyes staring. Some of these symptoms may be seen in other diseases. Frequently more marked symptoms wil be observed; in the udder there will be found painless firm nodules, the lymphatic glands as well as those of the knee and stifle are hard and at times break open and a cheesy mass exudes. The bones and joints in different parts of the body are swollen. Sometimes pus-like cheesy masses are coughed up which are again swallowed. A positive diagnosis can only be made when by examining the expectoration or milk, the tubercule bacillus is found. The tuberculin test is always a great aid.

Post-mortem examination of old cases will reveal the separate organs and their lymphatic glands studded with single or grouped nodules as above described. The kidney is generally affected in old animals and the spleen in young. In old animals calcified tubercular masses are sometimes found spread over the serous membranes. In younger animals soft tubercles are found in the lung, through dissemination by the blood, which have but slightly calcified, and the pleura and peritoneum may or may not be affected. The lungs or the mediastinal glands are most always affected. They contain either small or large tubercles with a cheesy, pus-like or calcified contents, or large bunches of yellowish-white firm nodules, about the size of a millet seed. These nodules later

on coalesce and caseate or calcify. The mucous membrane of the larynx, trachea and the bronchial tubes is seldom affected with tubercles or tuberculous ulcers. The pleura is affected in about one-third of all tuberculous cattle. At first small nodules form which become larger and calcify, or there may be wart-like growths of different shape and size (from a pea to a hazel nut, generally pointed, very seldom flat), which are at first red, then become turbid and calcify from the center; caseation very seldom takes place. By continued extensions these growths may vary to thirty centimeters or more in thickness.

Tuberculosis of the pleura manifests itself on the ribs, diaphragm, and lungs, and also the pericardium. In some cases isolated nodules are found, especially on the diaphragm and neighboring parts and in others the entire pleura is covered with them. The peritoneum becomes affected similarly to the pleura, but generally not to such an extent, nor as often (about one-sixth of all tuberculous cattle). The mucous membrane of the stomach and intestines shows tubercles and ulcers, but very seldom, however; the pancreas is diseased in about one-fourth of all tuberculous cattle. The liver either shows small isolated nodules, or large caseated cavities. The lymphatic glands of the liver are very often diseased without the presence of any tubercles in the liver. Tuberculosis of the liver occurs in about one of every twenty tuberculous cattle. The spleen is not as often affected as is generally supposed. In diagnosing a tuberculous spleen one must differentiate between the diseased peritoneum and the spleen substance proper. Tuberculosis of the kidney is found in about one-fortieth of tuberculous cattle (especially older animals). The tubercles are small and in numerous clusters. In the uterus, which is affected to about the same extent as the kidney, tuberculosis manifests itself on the mucous membrane in the form of pus-like cheesy patches, or there may be tuberculous nodules in the walls of that organ. The ovaries are seldom affected, but the suprarenal capsules are. Tuberculous udders contain small and large tubercules which are

caseated, calcified, or degenerated, or the udder may be one large, solid, hard mass, but as a rule only one-fourth is affected. (The hind quarters more than the front). The lymphatic glands are also always affected. The lymphatic glands of the muscles (shoulder, axilla, knee and fetlock joints), are found to be affected in about one of every hundred tuberculous cattle, especially the shoulder and the axillary glands. Very seldom are the brain, spinal column, bones (sternum, vertebra), or joints tuberculous, while tuberculosis of the flesh and testi- (sternum, vertebra), while tuberculosis of the flesh and testicle are exceptional cases. Tuberculosis may be very easily diagnosed in the advanced stage; on the other hand, it is difficult to distinguish it in its early stages from other diseases. It is therefore important to know that in tuberculosis small nodules with turbid centers form, which enlarge, caseate or calcify, surrounded by still smaller nodules and that in every case the corresponding lymphatic glands are affected. Often calcified tape worm cysts, actinomycotic fungus, simple calcification of the peritoneum and the foreign growths in organs are mistaken for tuberculosis.

(b) Tuberculosis in swine.

Swine take up the tubercle bacilli mostly in feed, seldom through the lungs. Swine kept in dairies are very often found tuberculous. Sometimes whole herds of swine, though apparently in good condition, will be found tuberculous on slaughtering. Large shipments of Hungarian swine which are very fat are found tuberculous.

(In America, swine tuberculosis is very rapidly increasing. There have been many cases found in the abattoirs; but it has been found, however, that tuberculous swine slaughtered in America differed from those of Europe inasmuch as they were not in the best condition. A. T. P.)

Symptoms: During life the symptoms of tuberculosis in pigs are less marked than those in cattle. As a rule, the general health of the animal is not impaired. Swelling of the different joints (especially the shoulder and knee-joint), lame-

ness, arching of the spinal column and swelling of the lymphatic glands of the neck are symptoms which strongly point to tuberculosis.

Post-mortem examination reveals, according to the dissemination of the disease, tuberculous nodules which have calcified and are smaller than those in cattle. The most prominent lesions are the diseased lymphatic glands of the bronchial tubes, neck and pancreas. For this reason the glands in every hog should be cut into. Tuberculosis of the liver is found in about 50 per cent of slaughtered swine; tuberculosis of the spleen in about one-third; the pleura is affected in about one-tenth and the peritoneum in only exceptional cases. Of all bones the vertebral are most frequently affected. The testicles of boars are oftener affected than in bulls, and tuberculosis of the kidney is very rare. The lesions of tuberculosis in swine reminds one of the lesions manifested in young cattle with a tendency to early calcification.

Abattoir inspection. Tuberculosis of swine can very easily be confounded with chronic changes of hog cholera and other swine diseases. Besides the simple method of determining the hog cholera bacilli, one can distinguish tuberculosis from the former, as the lungs in hog cholera show caseated cavities with adhesion of adjacent pleural surface and caseation of the lymphatic glands; while in tuberculosis the nodules are caseated in different places and rarely calcify.

(c) Tuberculosis in other animals.

Tuberculosis in other animals is very rare. In horses the post-mortem lesions are similar to those in cattle, infection takes place mostly through the lungs. In sheep, tuberculosis is to be distinguished from other caseated processes, which originate in the lungs and spread to different organs, and later form large, caseated, degenerated masses. Tuberculosis in goats is very rare. It also occurs in fowls. Fowls become emaciated; swellings will be found on the joints of the feet and wings, which, after bursting, discharge a cheesy substance. Post-mortem will reveal tuberculous nodules in the intestines and spleen, very seldom in the lungs.

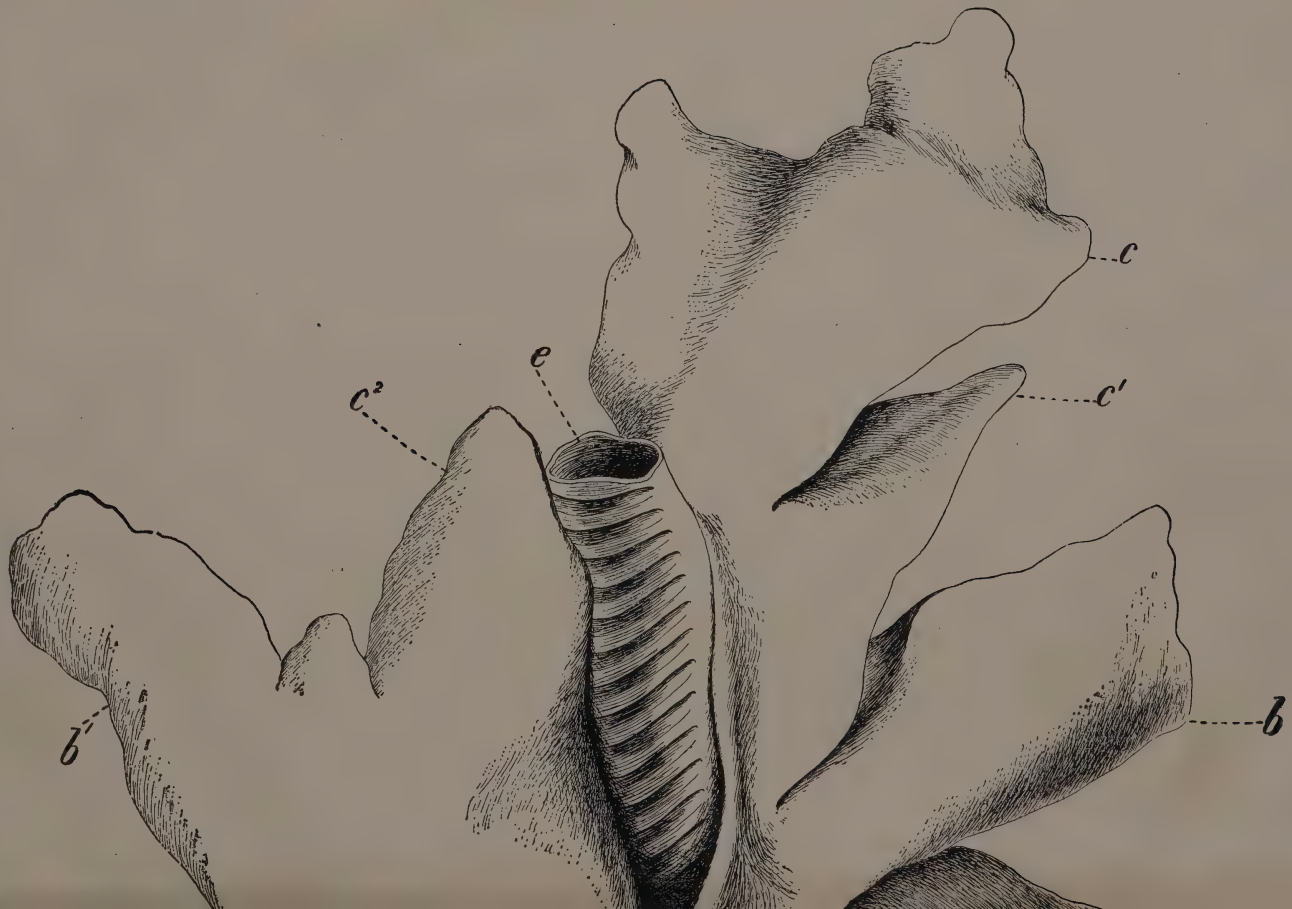
(d) Post-mortem of tuberculous animals.

Even if the usual methods of examination have been made see pages 92-100), one must necessarily make a more thorough one in order to satisfy himself to what extent tuberculosis existed in the body in order to decide what should be done with the meat. To determine the dissemination of tuberculosis in the animal body Professor Ostertag of the Royal Veterinary School of Berlin, has given us a definite key to go by. In determining the dissemination of tuberculosis, the pleura and peritoneum play the most important part, because tuberculosis spreads directly on these membranes; this is also true of tuberculosis of the larynx and the lymphatic glands of the head. Examination of tuberculous animals must not be commenced with the diseased organs, but with those which are apparently sound in order to avoid necessary contamination. For this reason incisions should not be made into visibly affected tuberculous parts, in order to avoid the spreading of the infectious matter. If an incision has been made in a tuberculous nodule it will not suffice to merely wipe the blade, but it must be thoroughly boiled or heated in a flame before further use.

According to Ostertag, the parts of tubercular animals are to be examined in the following manner:

1. The hock and thigh and the lymphatic glands of the groin.
2. Pleura, the pelvis and the lumbar region.
3. The dorsal vertebrae, the ribs and the breast bone.
4. The shoulder and the axillary glands.
5. The groin and the testicles.
6. The kidneys, the renal lymphatic glands, and the suprarenal capsules.
7. The spleen.
8. The liver.
9. The lungs.
10. The lymphatic glands of the head, mesentery, intestines and cervix uteri.

The udder is best examined by palpation. A tuberculous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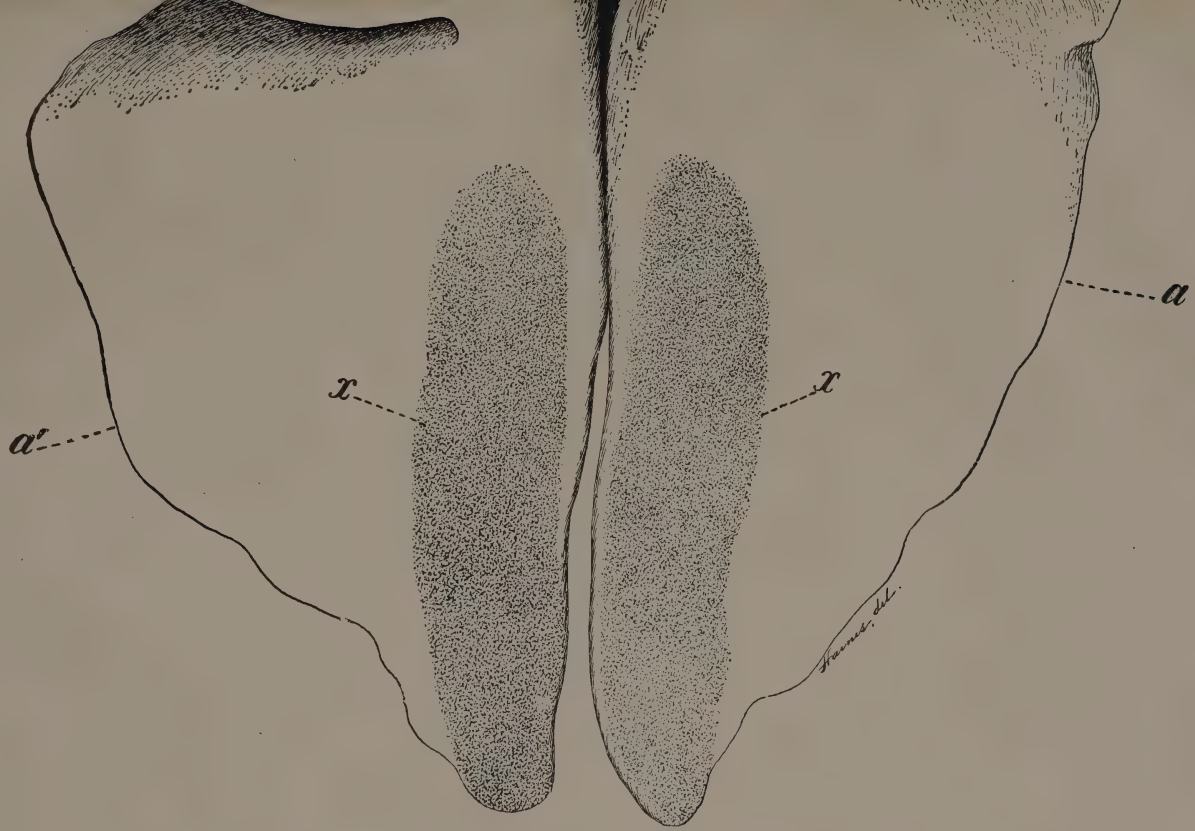

PLATE 9.—DORSAL ASPECT OF THE BOVINE LUNGS.

c
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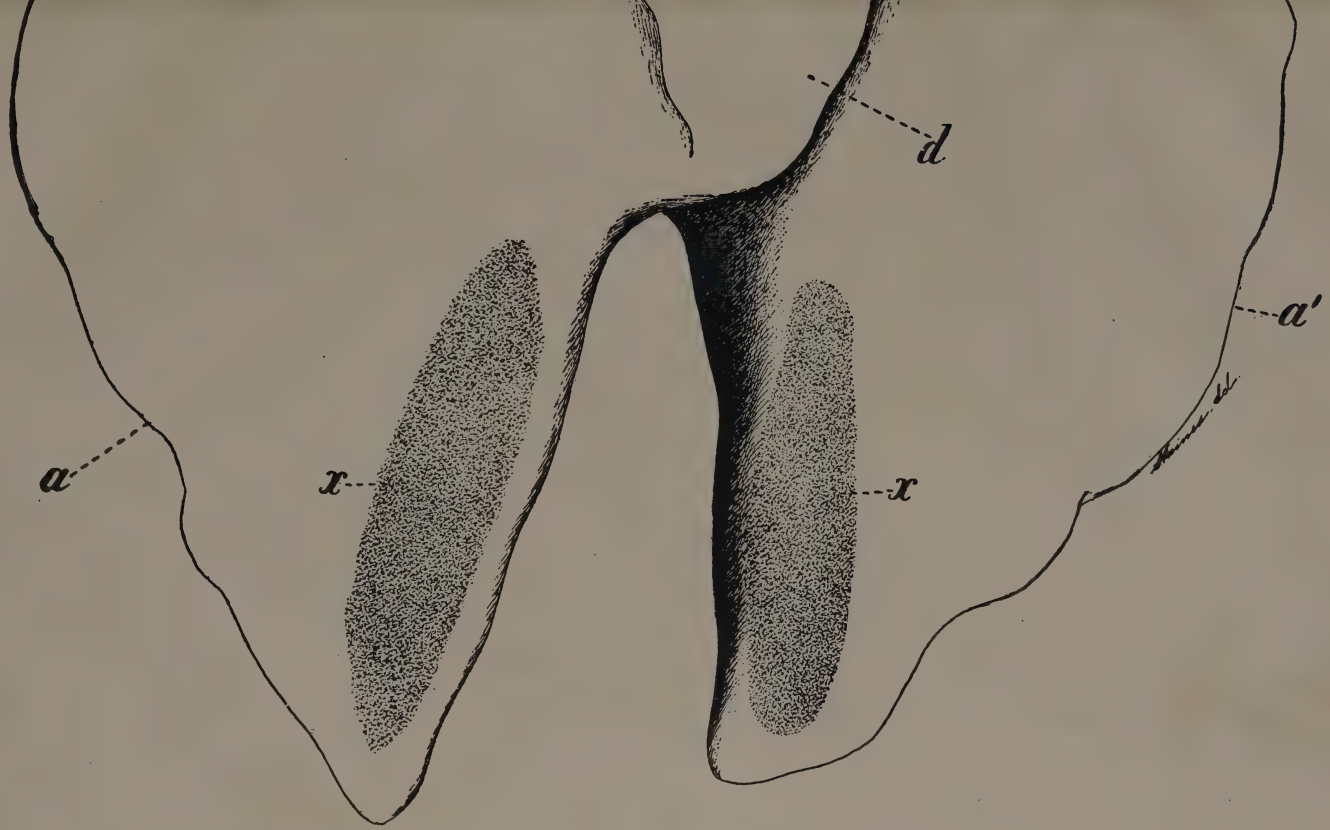


PLATE 10.—VENTRAL ASPECT OF THE BOVINE LUNGS.

udder shows a marked enlargement of one or more quarters and is solidified uniformly or knotty-like; an incision will reveal small, not caseated, but often calcified groups of nodules.

The lymphatic glands are always diseased. An incision into the kidneys should be made longitudinally. Examination of the related glands is indispensable. The spleen should be palpated and numerous longitudinal incisions made. It should be noticed that the lymphatic glands of the liver have not been previously removed. It is of great importance to note if the tuberculous masses in the small bronchial tubes have penetrated to the lung tissue (primary herd) or if they have been carried into the lung by the blood current (embolic herd). If the infection of the lungs took place through the trachea (primary bronchial pneumonia herd) there will be found at the base of the smaller branches of the bronchial tubes, newly formed tuberculous, cheesy, or calcified nodules, or small or larger cavities, especially on the point or lower edge of the lung. If infection in the lungs took place by the blood current these nodules will be uniformly disseminated in the connective tissue, which, as a rule, are of an even type and situated between the lobes of the lungs. If an examination is made according to this method the inspector cannot only determine to what extent tuberculosis existed, but he can also decide whether infection was direct or took place through the lymphatic vessels or through the portal or general circulation. In the latter case there would be a generalized tuberculosis. In all other cases, no matter how great the dissemination may be, it is considered as local. Tuberculosis is most easily and accurately diagnosed in the viscera; but pathological changes in the viscera with the changes in the four quarters or both halves assures one of a positive diagnosis to determine the extent of the dissemination, for the pleura and peritoneum are very seldom affected, therefore, the contamination of the organs is not so frequent. Besides, the animals affected with tuberculosis of the pleura and peritoneum do not make a very good impression, which is a great aid for beginners.

Plate 9. Dorsal Aspect of the Bovine Lungs.

The lungs are laid so that the dorsal (or upper) surface is shown. The various lobes are drawn apart so that their outlines may be distinctly seen. The lobes are named in the text as follows:

a, a 1, right and left caudal lobes, respectively.

b, b 1, right and left ventral lobes.

c, c 1, the two portions of the right cephalic lobes, denominated first and second cephalic lobes.

c 2, left cephalic lobe.

e, trachea.

x, region most frequently involved in the early stages of pulmonary tuberculosis. The lesions in this stage are, as a rule, embedded in the lung tissue and are invisible from the surface.

Plate 10. Ventral Aspect of the Bovine Lungs.

The letters correspond to those of plate 9.

a, a 1, right and left caudal lobes.

b, b 1, right and left ventral lobes.

c, c 1, first and second right cephalic lobes.

c 2, left cephalic lobe.

d, azygos, or median lobe (belonging to the right lung). This lobe is involved in the most advanced cases only.

e, trachea.

x, usual location of the earliest lesions of tuberculosis.

Plate 11. Trachea and Bronchial Tubes of the Bovine Lungs Showing Attached Bronchial Glands.

a, al, air tubes supplying the right and left caudal lobes.

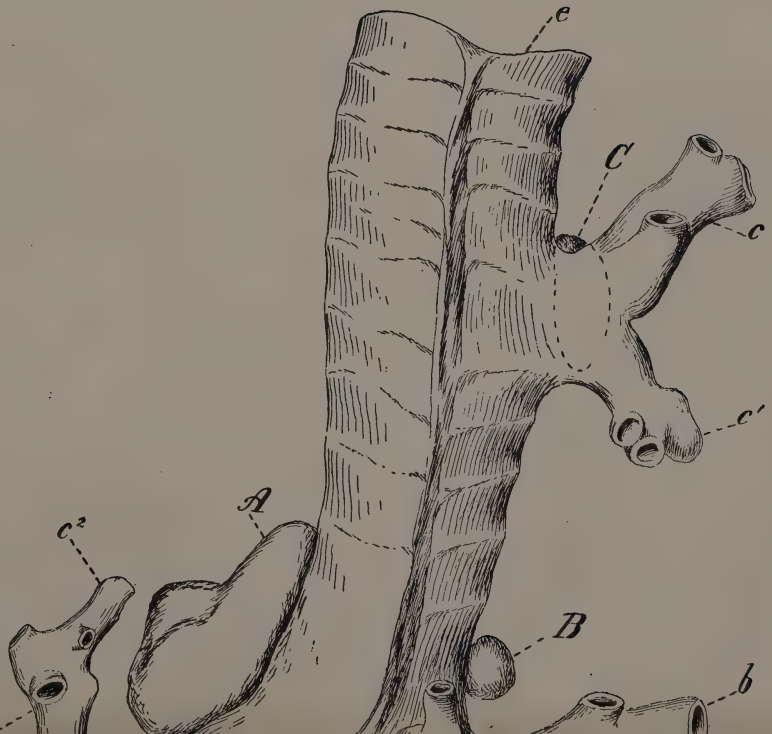
b, b 1, air tubes supplying the right and left ventral lobes.

c, c 1, branches of the right supernumerary bronchus supplying the first and second cephalic lobes of the right lung.

c 2, air tube supplying the left cephalic lobe.

d, branch of azygos lobe.

e, trachea.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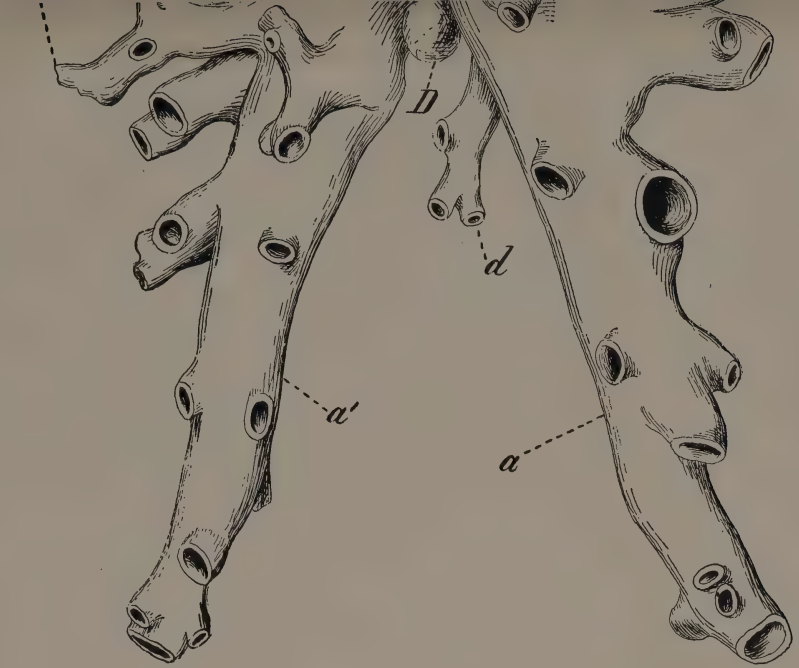


PLATE 11.—TRACHEA AND BRONCHIAL TUBES OF THE BOVINE LUNGS, SHOWING ATTACHED BRONCHIAL GLANDS.

A, left bronchial lymph gland.

B, right tracheal lymph gland.

C, lymph gland at root of right supernumerary bronchus.

D, gland in the angle between bronchi, not always present.

The minute intra-pulmonary glands, situated along the main bronchi, are not shown.

Plate 12. Dorsal Aspect of the Bovine Lungs Showing the Position of the Posterior Mediastinal Glands.

a, a 1, caudal lobes.

b, b 1, ventral lobes.

c, c 1, c 2, cephalic lobes.

e, trachea.

f, oesophagus.

g, muscular pillars of the diaphragm.

h, posterior aorta cut through just beyond the arch and reflected so as to uncover the left bronchial gland A, resting against the root of the left bronchus.

i, caudal margin of the ligament of the lungs (ligamentum latum).

The mediastinal glands are shown most of them resting on the oesophagus. The aorta, fat, and the pleural layers which inclose the posterior mediastinal space laterally, are removed.

a, the large caudal gland resting below the oesophagus on the pillars of the diaphragm. This gland may be left in the body when the lungs and heart are removed unless special care is taken. The remaining mediastinal glands are arranged in two sets, on the right and left margin of the oesophagus. In this animal there is but one gland in the left chain. a, is the gland most frequently diseased and in many cases enormously enlarged.

a 1, the most cephalic of the mediastinal series.

Plate 13. Section Through the Medium Plane of the Head of a Cow to Show Location of the (Left) Retropharyngeal Gland

a, brain cavity.

b, nasal septum.

c, lower jaw, sawed through.
d, tongue.
e, posterior nasal passage.
f, trachea.
g, epiglottis, resting against soft palate.
h, oesophagus.

A, retropharyngeal gland, in this case enlarged to twice the normal size by tuberculous deposits.

The opening into the left tonsil is shown as a dark spot under the soft palate. The tonsil itself is situated beneath the mucous membrane, where the cut surface of the palate appears and projects slightly above this, so as to lie in part under the mucosa of the posterior nasal passage.

Plate 14. Right Lateral Aspect of Posterior Half of a Steer's Head with Skin and Superficial Fat Removed to Show Location of the Lymph Glands. (x 2-3).

a, lower jaw.
b, ear passage.
c, horn, sawed through near base.
d, styloid process of occiptal bone.
e, parotid salivary gland.
f, submaxillary gland.

A, right parotid lymph gland, partly hidden under the anterior border of the parotid salivary gland.

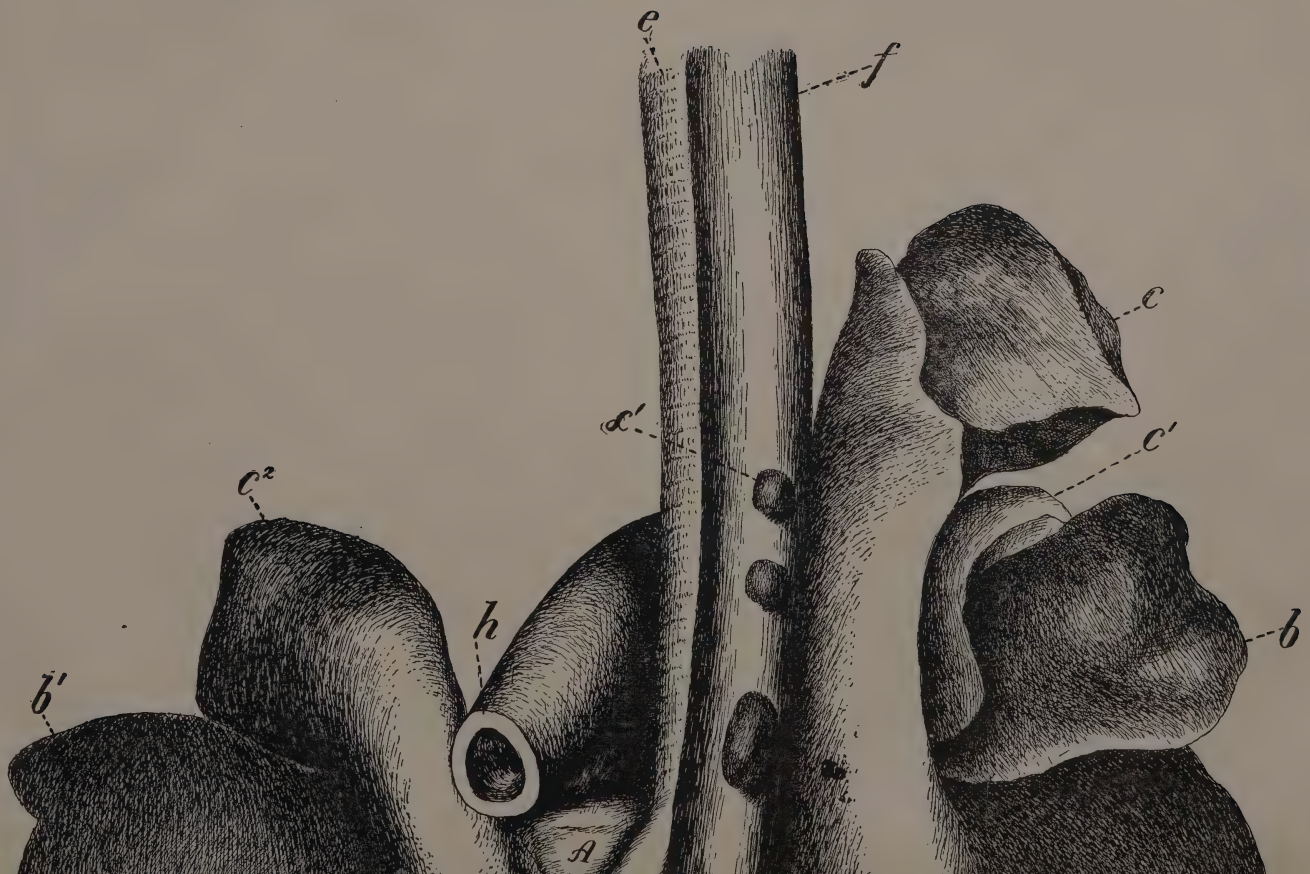
B, right post-maxillary glands, the greater portion concealed beneath the submaxillary salivary gland.

C, right, submaxillary lymph glands between ramus of the lower jaw and submaxillary salivary gland.

Originals in Bulletin No. 7, Bureau of Animal Industry.

2. ACTINOMYCOSIS.

Actinomycosis is caused by a fungus and is principally seen in cattle. Occasionally it is observed in man and swine, also in horses on the spermatic cord. A direct transmission from animal to man has not been observed. The cause is a fungus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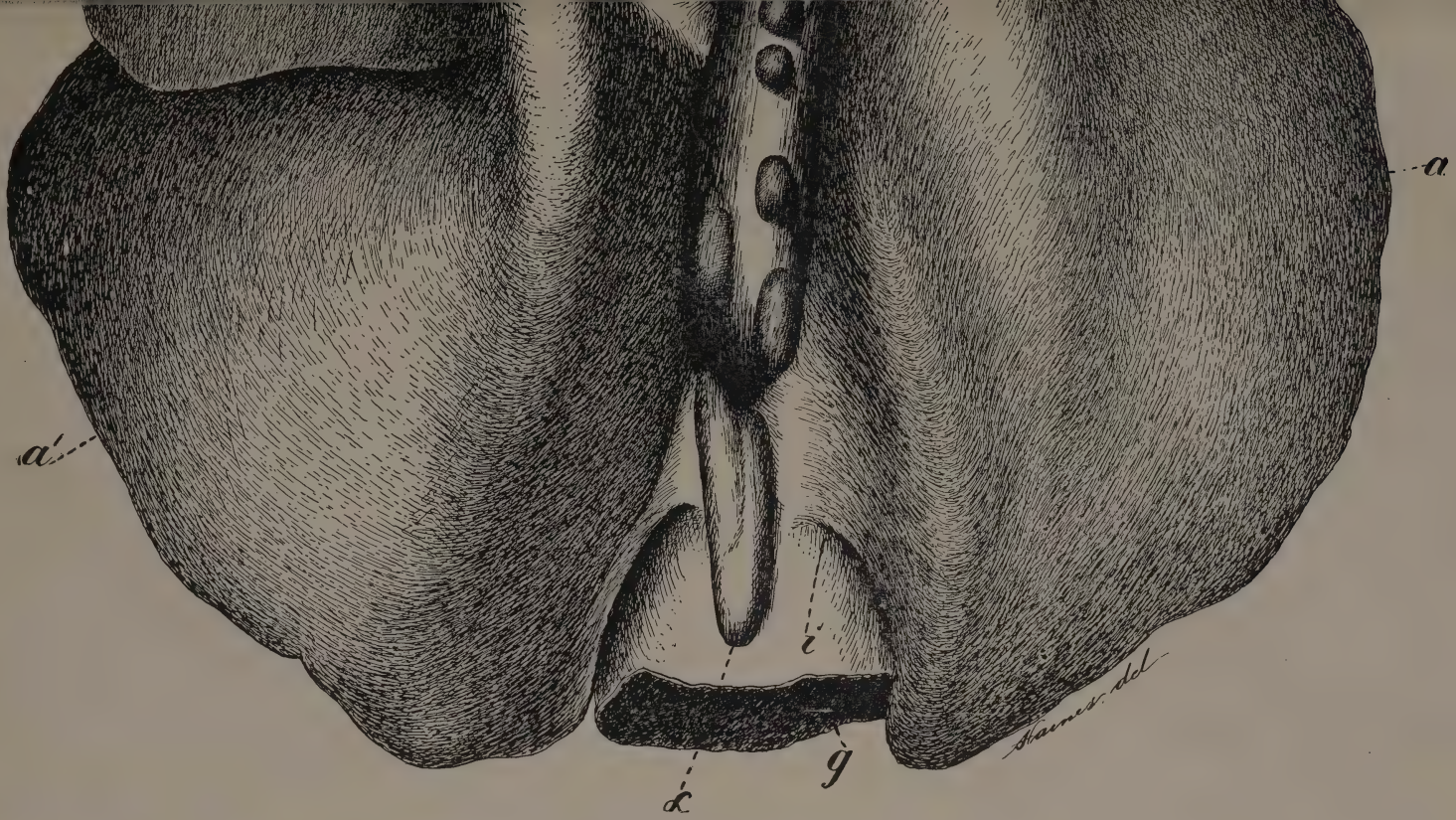


PLATE 12.—POSTERIOR MEDIASTINAL GLANDS.

which is found on blades of grass, and which may lodge between the teeth and penetrate the gums and tongue.

Symptoms: In cattle actinomycosis appears mostly on the upper and lower jaw, or on the tongue. The maxillary bone enlarges, becomes hard and very often suppurates, yielding a grandular, dirty, yellowish-red discharge, which dries and forms into crusts. When the tongue is affected it often has isolated hard nodules, or it may be enlarged, solidified and immovable (wooden tongue). The lymphatic glands of the throat and jaw are sometimes affected. Actinomycotic growths are found on the skin of the head and neck and may attain the size of two fists. (See Fig. 11.)

Post-mortem examination reveals, in addition to the above pathological lesions, small nodules in some cases, in others large caseated cavities in the lungs, in which case the lymphatic glands are seldom affected. The udder, breast bone, diaphragm and the liver may also become affected, or there may be a generalized affection similar to that of tuberculosis, but this is very rare. In swine the actinomycotic growths are found on the tonsils in the form of small nodules, or in the scrotal sack in the form of caseated cavities; they are found in the lungs, the tongue, on the jaw, or in the vertebrae (see page 232). The diagnosis of actinomycosis in cattle during life is simple and is chiefly based on the usual location of actinomycotic growths, such as the jaw-bone, the tongue, the lymphatic glands, and the skin of the head and neck, which are mostly endurated swellings, very often suppurate, or upon incision show yellowish sandy-like masses. The disease can be distinguished from tuberculosis by the fact that the related lymphatic glands are not affected. (The ray fungus is readily detected in the pus with the microscope. A. T. P.).

Abattoir inspection. A direct transmission of actinomycosis from animal to man has not been observed, therefore, the affected organs are not looked upon as unwholesome, but on account of the morbid changes they are condemned and excluded from commerce. If the tongue is affected then it alone

is condemned. If there is a general infection (of the muscles, vertebrae and lymphatic glands), which occurs very seldom, then the whole carcass is to be condemned. If only individual

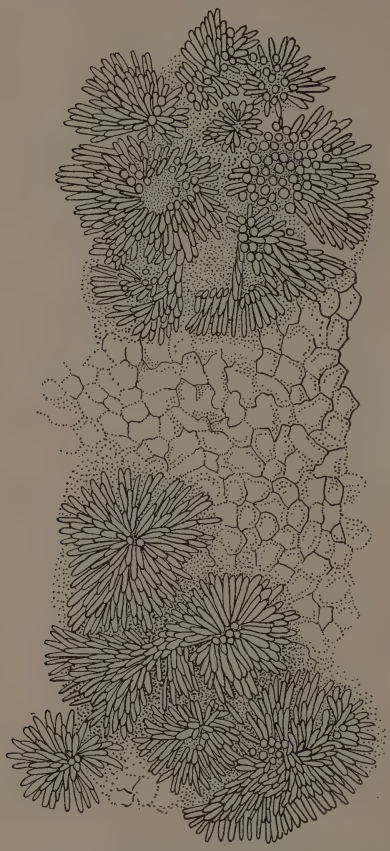
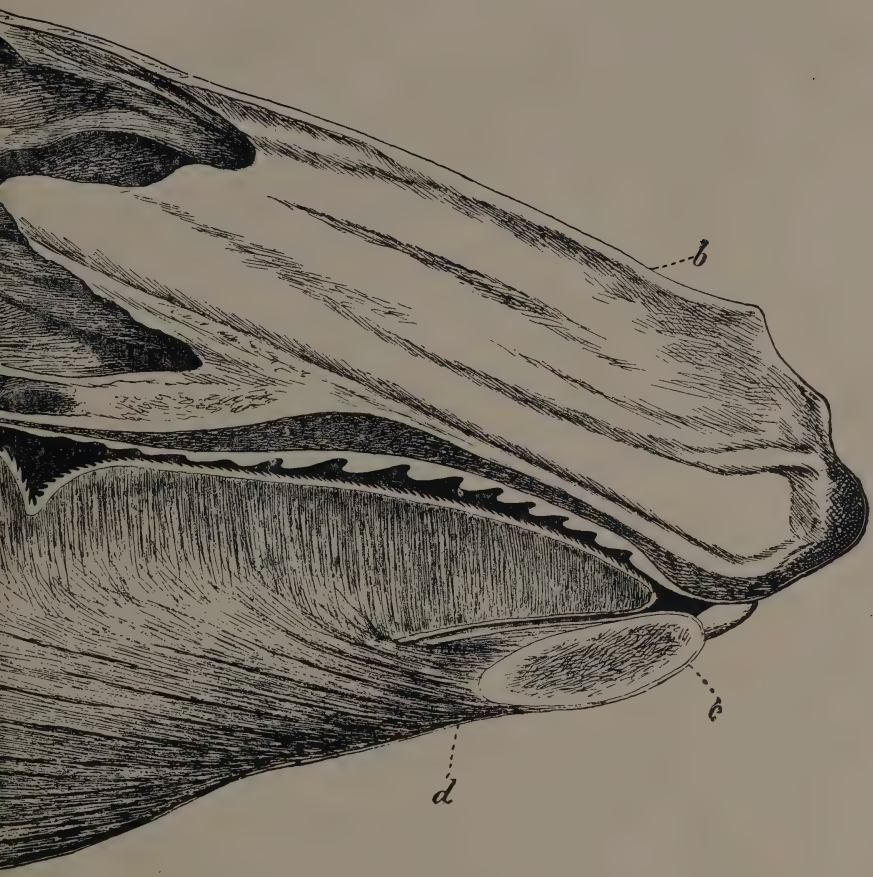


FIG. 11—ACTINOMYCOSIS.

organs are affected, they are to be condemned and the rest of the flesh allowed to be sold.

(Direct transmission of actinomycosis from animal to man has not been proven. In the United States there has been a

PLATE 13.—SECTION THROUGH THE MEDIAN PLANE OF THE HEA
LYMPH



F A COW TO SHOW LOCATION OF (LEFT) RETROPHARYNGEAL
LAND.

controversy over this question and the reader is referred to the publication of the Bureau of Animal industry, Bulletin No. 2, which gives a more direct and complete analysis of this disease and gives experiments with lump jaw made at the Chicago Stock Yards. Dr. Trumbower, former State Veterinarian of Illinois, who has had extensive experience in both ante-mortem and post-mortem examinations, says, "Inasmuch as actinomycosis is usually confined to the head and may be said, in one sense, to be a local disease, many of the European inspectors condemn only the parts involved, the head as a rule." However, Dr. Trumbower's methods appear safest and most practicable. Whenever the actinomycotic abscess opens into the mouth, pharynx, larynx or any part of the digestive or respiratory tract, the entire carcass is condemned. Also when the lymphatic glands are involved, or there are actinomycotic tumors in the lungs, or the lesions have become generalized, the entire carcass is condemned. In cases where the actinomycotic lesions are positively localized and the abscesses have erupted only upon the external surface, the infected parts may be cut away and the balance of the carcass used for food. A. T. P.).

3. TETANUS.

Tetanus occurs in all domestic animals and also in man. It is caused by the tetanus bacillus which is found in the ground and incidentally enters the body through wounds. The bacillus itself does not enter the blood. Only the wound in which the infection takes place contains the tetanus bacilli, therefore the disease can be transmitted from an infected wound.

Symptoms: Tetanus generally begins with a stiffness of the neck and head and tonic spasms of the masseter muscles (lock jaw). Later tonic spasms spread over the entire body. The animal becomes stiff and moves with great difficulty or not at all and the muscles feel hard. When the animal is touched or a very sudden noise is made, it quivers and shudders. Usually there is no fever.

On post-mortem examination the muscles are slightly turbid, abnormaliy soft and the heart presents a cooked appearance. Usually post-mortem changes in other organs are absent.

FIG. 12. (TETANUS).

Abattoir inspection. In Europe it is claimed that the flesh and organs are not unfit for food; but the part through which infection took place is destroyed. (In America the animals affected with it are condemned. A. T. P.).

4. PYAEMIA.

Suppuration is caused by various bacteria and occurs in different forms. On the mucous membrane pus forms on the surface and is very easily discharged (suppurative catarrhal fever). In suppuration of the pleura, peritoneum or joints, pus accumulates in the abdominal or thoracic cavities, or in the joints. In suppurating organs the pus either infiltrates the tissue or it concentrates in large quantities in a certain place and forms a purulent mass or abscess. As a rule suppuration is limited to the seat of infection. The pus either erupts externally, flows off and the parts heal, or the mass of

PLATE 14.—LATERAL ASPECT OF POSTERIOR HALF OF A STEER'S HEAD TO SHOW LOCATION OF LYMPH GLANDS.

c
b

pus may be enclosed in a capsule. In exceptional cases there may be a generalized suppuration which is caused either by dissemination through the lymphatic glands or vessels to the blood, or the pus may penetrate into a vein and thus enter the general circulation. In the latter case the pus is first taken by the blood through the right ventricle to the lungs, then through the general circulation all over the body; for instance, in the liver, spleen, kidneys, joints, muscles, etc., new abscesses will be seen far from the original seat of infection, which in turn may cause other abscesses. In some cases there may be purulent inflammation of the marrow of the bones. This general infection of the blood in the general circulation the pus being carried to the organs and forming abscesses is called pyemia (suppurative blood poisoning, suppurative fever).

Symptoms: During life the symptoms are not very marked. Intermittent fever with chills or rigors exists with a general diseased condition. In some cases abscesses can be detected in different affected organs (lungs).

Post-mortem examination reveals the original suppurating mass, and in most cases also new abscesses in other organs, especially the lungs. Besides these the other internal organs (liver, spleen, kidney, mucous membranes of the stomach and intestines and muscles), are softened, swollen and inflamed. Pyaemia is not always fatal, but recovery is rare. In this case animals which showed no symptoms before slaughtering show upon post-mortem pus abscesses in individual organs which are enclosed in dense capsules. The internal organs are generally much altered.

*An occasional case of pyaemia or multiple abscesses throughout the body is met with. Investigation usually reveals the source of infection in a suppurating wound or purulent inflammation of the uterus or serous membrane.

Cold abscesses may be found in all parts of the animal carcass, but are most frequently found attached to a thoracic or

*S. S. page 106. Report of 1898. U. S. Vet. Med. Asso.

abdominal viscus. There is very rarely more than one in any individual and they vary greatly in size. They are most frequently found in young, highly developed rapidly fattened cattle which present appearances of perfect health. They consist of a very dense limiting membrane, enclosing a whitish, odorless purulent fluid which is rather grewsome to look upon, but innocuous. There is no morbid disturbance in the structures contiguous to such abscesses, and they can be enucleated leaving the carcass wholesome for food.

There are cases of septic infection from a retained foetus or placenta, or from a gangrenous organ or wound which will call for condemnation. The carcass in such cases gives out a disagreeable odor and does not dry and harden when placed in the refrigerator.

Abattoir inspection. Pus in man and animals is caused by the same bacteria. The pus of animals causes disease in man and, therefore, all parts which contain or are contaminated with pus are unfit for food. If the animal showed no symptoms before slaughter or if on post-mortem only capsuled suppuration masses or isolated suppurations are found (such as suppurating wounds) the affected parts only are considered unwholesome.

(a) PYAEMIC ARTHRITIS IN YOUNG CALVES. The umbilical cord (see page 31) should dry up without inflammation, drop off and leave a scar. Very often, however, suppuration develops in the naval and extends to the naval vein, from whence pus enters the circulation and develops purulent arthritis.

Symptoms: The pathological lesions at the navel may heal or be so slight that they will not be noticed. In the first place there is general disturbance, then difficult breathing, diarrhoea and very rapid emaciation. Swellings appear in one or more articulations (especially on the elbow, knee, fetlock, hip and stifle joints). These swellings are warm to the touch and cause lameness.

Post-mortem examination shows swellings of the internal organs, wedge shaped nodules in the lungs and purulent dis-

charges from individual joints. There are some cases which show no symptoms during life, but post-mortem reveals purulent caseated nodules in the internal organs, especially in the liver and lung, and in the joints. These nodules are encapsuled, and are very often found in old well nourished animals which do not show any symptoms during life.

Abattoir inspection. The encapsuled nodules do not affect the flesh, therefore, only the affected organs are destroyed. (In America all affected parts, as well as the carcass are destroyed. A. T. P.).

(b) PUERPERAL FEVER is especially seen in cows after parturition and is a chronic purulent catarrh of the mucous membrane of the womb. During life the muscles around the pelvis are sunken; at times there is a flaky, slimy, putrid discharge from the vagina which soils the tail and posterior limbs. The mucous membrane of the vagina is generally inflamed. As a rule the animal looses flesh. In very rare cases the animal shows signs of general disturbance during life and after death pus nodules are found in the organs.

Abattoir inspection. If the disease is localized to the womb the flesh is not injurious, but it is condemned when the animal is emaciated.

(c) BONE SEPSIS is confined mostly to suppuration of the bones and articulations, but may also occur without any outward perceptible cause. It generally exists in the form of liquefaction of the bone marrow and suppurating nodules in other parts of the body.

Abattoir inspection. The flesh of such animals is injurious and should be condemned.

(d) PYAEMIC INFLAMMATION OF THE LUNGS occurs particularly in sheep, but also in calves. In sheep it is very often mistaken for tuberculosis. Large pus cavities are found in the lungs which, as a rule, are encapsuled and at times give rise to new abscesses in the flesh and organs. The spleen especially and the lymphatic glands often contain a

number of these abscesses. The newly formed abscesses very soon become variously encapsuled.

Abattoir inspection. If the pus is concentrated in the lungs or encapsuled in individual organs only those parts are condemned. When the animal is very much emaciated and the meat watery the carcass is to be looked upon as unfit for food.

(e) PYAEMIC INFLAMMATION OF THE PLEURA AND PERITONEUM is caused by an injury in the breast or abdomen, or by an abscess in some internal organ penetrating the respective cavity. This condition usually terminates in a general pyaemia (blood poisoning) and death, but it may, in cattle especially, become encapsuled and heal.

Abattoir inspection. The flesh is to be condemned when there is no induration or capsulation.

(f) PYAEMIA AFTER HOG CHOLERA. In hog cholera individual vaseated abscesses may lead to a general pyaemic condition of the internal organs, muscles and articulations, especially the elbow, knee and fet-lock.

Abattoir inspection. The animals emaciate very rapidly and the flesh should be condemned.

(g) PYAEMIC ABSCESSES BETWEEN THE DIAPHRAGM AND THE KIDNEYS are sometimes found in cattle. They are usually localized and the flesh is passed for consumption. The abscesses should be carefully removed so as not to contaminate the neighboring parts with pus. When contamination has occurred the entire parts should be condemned as mere rinsing will not suffice.

5. SEPTICAEMIA.

Under this head are classified a large number of diseases which are caused by poisonous material in some part of the body having entered the blood and causing a general disturbance. In this case, as a rule, no marked symptoms are found at the seat of infection; but in some cases there is a necrotic, dirty, sanious discharge from the part where the infection takes place. These particular diseases are characterized by

inflammation of large areas or cavities (as the mucous membrane of the stomach and intestines, pleura, peritoneum, articulations, uterus, navel, etc.), which very often leads to a general infection, without any perceptible order or pathological changes. The fact is of great importance to the meat inspector, in as much as it is a form of blood poisoning (septicaemia) which may cause many a human sacrifice. An inspector must, therefore, be well acquainted with the symptoms of this disease.

Symptoms: During life the animal has a high fever with severe general disturbance, great weakness, fainting spells, etc. In some cases there will be putrid, offensive, dirty, grayish-red, or abnormally colored modifications at the seat of the disease, umbilicus, pleura, peritoneum and the like.

Post-mortem examination does not show any very striking variations from the original lesions in any one organ; but, on the contrary, all the organs are more or less affected as follows:

(a) The spleen is swollen, very dense, dark red, and edges rounded and the contents soft.

(b) The mucous membrane of the stomach and intestines is swollen, has dark red spots, shows ridges or folds, and is covered with a tough mucus. The glands of the mucous membrane of the intestines are swollen, protrude on the surface and are circumscribed by a red zone. The large intestine is not so frequently affected as the small one.

(c) The kidneys are swollen, the capsule distended, and the substance of the cortex is turbid; red dots are distinct and the medullary portion darker.

(d) The liver is swollen, turbid, grayish-brown and soft.

(e) The muscles of the body are grayish-red, in some instances dark red, contain hemorrhages throughout and are watery, shiny, very fragile, somewhat flabby and soft.

(f) The heart is somewhat of the same nature; is somewhat grayish and has the appearance of being parboiled.

(g) The lymphatic glands are swollen, contain much liquid,

are grayish-red with distinct red spots and the surroundings of the lymphatic glands watery.

(h) The abdominal and thoracic cavities and pericardium contain a small amount of clear yellowish-red fluid.

(i) The pleura, peritoneum and the internal and external surfaces of the heart present round or streaked hemorrhages.

These conditions are not so pronounced in all cases and especially in animals that have been thoroughly bled they are not so easily diagnosed. As a rule the pathological changes are always present in the liver, heart, kidney, pleura and peritoneum.

(j) SEPTIC ARTHRITIS IN CALVES. The navel may not only show the pyaemic conditions as on page 154, but also the septic changes. As a rule it is off color, is very flabby, and upon pressure a very purulent, dark red substance exudes which is usually offensive. Calves manifest great weakness and numerous sensitive and inflamed swellings over the joints (fetlock, knee, hip joints).

Upon post-mortem examination there will be found in these joints a very dirty exudate, and the capsules are filled with a yellowish coagulated substance. Besides this the internal organs are swollen and turbid.

Symptoms: The symptoms are based on the pathological changes in the internal organs and the sanious fluid in the joints, which is always present. When examining calves it is therefore very important to observe the condition of these joints. This disease must not be confused with bruises or injuries received on the joints during transportation or slaughter, which are redder and generally not localized to the joint itself, which is normal.

Abattoir inspection. If the animal shows a general disturbance during life or on post-mortem examinations the above pathological changes, the carcass should by all means be condemned.

(k) SEPTIC PUERPERAL FEVER is caused either by a putrifying substance, such as the retention of the afterbirth,

or by wounds contracted during parturition, in which case the surface of the mucous membrane of the uterus and vagina is covered with a sanious pus-like material.

Symptoms: During life there is a very dark, offensive discharge from the vagina, weakness and high fever. The fever as well as the discharge may be absent in some cases. The above described condition of the uterus and vagina may be found after slaughter and the contents of the uterus and vagina is often putrescent; besides this the organs are swollen and turbid. On the walls of the pelvis as well as the posterior parts of the abdominal cavity hemorrhages are often found, and appear to have been infiltrated or are similar to peritonitis. The lymphatic glands of the pelvis and the posterior parts of the abdominal cavity are greatly swollen and infiltrated with bloody fluid.

Abattoir inspection. The flesh of all animals affected with this disease should be condemned.

(l) SEPTIC INFLAMMATION OF THE UDDER. There are many forms of inflammation of the udder, especially in cows, which terminate in either suppuration, calcification, or recovery. These forms are not of much importance to an inspector because they are of a purely local nature; but there are inflammations of the udder of cows and sheep which are accompanied by a general diseased condition and which, as a rule, terminate in death. It is necessary to make a distinction between inflammation of the udder, no matter what form, and a disturbance of the general condition of the animal.

Upon post-mortem the internal organs are found slightly swollen and turbid. The udder, as a rule, is only swollen and without any septic changes.

Abattoir inspection. The flesh of all such animals is injurious and unfit for food.

(m) HEMORRHAGIC (OR SEPTIC) ENTERITIS. This disease occurs in calves, cattle and also other animals (pigs).

Symptoms are loss of appetite, constipation, followed by

diarrhoea, faeces very offensive and streaked with blood, weakness, drowsiness, and general disturbance. In Germany these animals are killed to prevent natural death.

Post-mortem shows the mucous membrane of the intestines to be swollen, and containing numerous red patches and gangrenous surfaces on the greatly inflamed mucous membrane. The remaining organs, especially the pancreas, are swollen and turbid and show hemorrhagic infractions on the serous membranes. This disease can be distinguished from gastro enteritis by its rapid progress and by the great weakness and drowsiness before as well as the pathological changes of the intestines and the other organs after slaughter.

Abattoir inspection. The flesh is injurious and the carcass should be condemned.

(n) PULMONARY GANGRENE is considered the sequel to pneumonia, and during its course individual parts become necrotic and terminate in decomposition and cause blood poisoning. The gangrenous parts may become encapsuled (especially in sheep). In this case there will be found large cyst-like bodies in the thoracic cavity with variously (often green) colored, offensive contents, while the animal seems apparently healthy.

Abattoir inspection. The flesh may be used after removing the affected parts. If the carcass be emaciated and the flesh seems watery it should be confiscated. If there seems to be a general disturbance during life, and after slaughter the organs are swollen, the flesh is injurious.

(o) SEPTICAEMIA OF THE PLEURA AND PERITONEUM. This disease is similar to pyaemia, and penetrating wounds on them are just as dangerous as invasion from internal organs (stomach, intestines, uterus) to the abdominal cavity. In many cases (especially cattle) wounds can be made penetrating the abdominal cavity, such as puncturing the rumen, or making an incision into it for tympanitis without a general peritonitis. In calves this disease must be distinguished from ulcers of the stomach, which often penetrate the

abdominal cavity. During life the animal shows a general disturbance (fever, weakness, diarrhoea).

Upon post-mortem the organs will be found very much swollen and turbid. The pleura and peritoneum have a skin-like, dark, sometimes greenish coating, which can easily be removed in large pieces from the highly inflamed ulcerous pleura or peritoneum. This is the condition on parts or the whole of the pleura or peritoneum.

Abattoir inspection. The flesh of animals thus affected is injurious and unfit for food.

(p) SEPTIC WOUNDS. Wounds of bones, joints, feet, and especially wounds caused by punctures or bruises very often terminate in a septic condition and cause a general disturbance. At stated times and in distinct places this septic condition becomes contagious. Pathogenic elements can only enter the blood as long as the wound is not covered with granulating tissue. The animals manifest a high fever, drowsiness, and a disagreeable odor at the seat of infection.

Upon post-mortem are found more or less defined symptoms of blood poisoning.

Under the head of wounds in swine, the bite wound should receive special attention. Animals which but a few hours previous seemed to be in perfect health suddenly manifest great weakness and high fever and die if not killed. Upon close examination one usually finds that the right or left ear, or the skin behind the ear, or on the abdomen, is greatly swollen. Sometimes only a very small surface is swollen. At the point of the swelling there is usually found a dark red, very distinctly circumscribed scab or wound. Upon incision into the affected part a dark colored, very sanious substance, which is mixed with grayish-red shreds, exudes. In the cavity, shreds of necrotic connective tissue will be found hanging to the walls of the cavity. The cartilage of the ear from which the connective tissue is raised has a dark yellowish-red color and is rough. These are the usual symptoms. Sometimes the swelling of the pole, neck, or on the abdomen will spread, in

which case it is easily observed. In other cases swellings will be found in different places, especially on the shoulder, the abdomen, the knee, or on the back, etc., which vary in size from that of a walnut to that of a baseball and do not, as a rule, show any discoloration and are not, therefore, readily noticed in fat animals. If an incision is made into the swelling sanious centers will be found. Gangrenous bite wounds are readily distinguished from others in-as-much as they quickly discharge an ichorous fluid. Dark red or black spots of different sizes which upon incision have the same consistency as the bite wound itself will be found on the shoulder, thigh, on the side of the abdomen, or on the extremities. In some cases these bite wounds heal. In such cases animals which seem perfectly well, will have offensive nodules in the fat, varying in size from a walnut to an apple, in different parts of the body. A similarly encapsuled, very offensive substance will sometimes be found in the cicatrix of a castrated sow.

Abattoir inspection. If these areas are encapsuled, the organs not swollen and the animals healthy before slaughtering, then the areas should be removed and the flesh allowed to be put on the market. Care should be taken not to cut into the areas and contaminate the surrounding flesh with the contents. If the animal showed any symptoms of a general disturbance before slaughtering and if the mass is not encapsuled, the flesh is injurious even if the organs are but slightly altered. (For further particulars see rules of the Bureau of Animal Industry. A. T. P.).

(q) FOREIGN BODIES IN THE FIRST AND SECOND STOMACH OF CATTLE.

Under this head may be included a large number of diseased disorders caused by the presence of foreign bodies. Foreign bodies in the first and second stomach of cattle, especially of cows, are often found, without the least symptoms of disease being manifested. Buttons, stones, money, different kinds of needles, nails, wires, pieces of iron, knives, forks, and such things will be found. If these foreign bodies are blunt they

remain in the first and second stomach without any marked symptoms. Pointed articles penetrate the walls of the stomach and enter the throacic cavity, sometimes puncturing the heart and pericardium or the lungs, or they may penetrate the organs of the abdominal cavity (liver, spleen), or the walls of the abdomen, between the ribs, between the vertebrae, in the muscles of the thigh, etc. As a rule a penetrating body moves very slowly, at the same time a great deal of tissue is formed, making an enclosed canal, which indicates the way the foreign body has taken, thus causing many adhesions between individual organs, for instance, between the reticulum, the diaphragm, the pericardium and the heart, the pericardium and the lung, the lung and the pleura, the liver and the rumen, the rumen and the spleen, the diaphragm and the liver, and the like. As this foreign tissue is continually being infected by the food from the stomach which enters the canal, it becomes polluted with purulent or putrid centers of different sizes, generally encysted. These centers are not only found in the above named organs, but also in the newly formed tissue, so that often irregularly united masses of connective tissue from different organs, in which encapsuled, purulent or putrid centers occur are found. Putrid areas caused by foreign bodies may penetrate the abdominal or thoracic cavity and thus cause septic pneumonia or peritonitis accompanied by blood poisoning.

The symptoms during life are varied. If the pathological changes are not very pronounced the animals will show no appreciable symptoms. In severe cases the symptoms are more or less marked, according to the organs affected (difficult breathing, disturbance of the heart, swelling, dropsical condition, lack of appetite, etc.). As a rule fever is not present. If one of these cysts has bursted in the thoracic or abdominal cavity, there will be a very general disturbance (high fever and weakness) and death follows. In this case the above named pathological changes, or putrid fluid in the thoracic or abdominal cavities, or pericardium, or swelling of the internal organs, will be found on post-mortem.

Abattoir inspection. Simple deformities of one or more organs are of no importance. If one or more encapsuled centers are found they should be removed. If emaciation has set in during the time that the organ has become affected (especially the heart) or if the flesh seems watery, it is considered unfit for food. If the infected area is not yet capsuled and an invasion into the thoracic or abdominal cavity has taken place or if the animal showed fever or weakness before slaughtering, the flesh is injurious. As a rule cases in which purulent or septic infection has occurred are rare. On the contrary the neoplastic formations may be extensive and numerous large purulent or putrid areas formed without the pathogenic properties entering the circulation.

XII. DISEASES CAUSED BY ANIMAL PARASITES. THE INVASION DISEASE.

The parasites which exclusively or incidentally live on or in domestic animals are very numerous. Very few are of importance to the inspector. These parasites are classified as follows for the meat inspector:

First, those harmless to mankind. Second, those directly harmful. Third, those indirectly harmful.

The most important parasite is the trichina. This will be described in a special paragraph (see page 202). The description of the other parasites will take place in the order of their importance and those resembling them and inhabiting the same places will be mentioned next.

I. CYSTICERCUS CELLULOSAE.

Measles in swine. Measles in swine is a larval form of a tape worm in man and is only developed when pigs take up fertilized eggs of this human tape worm. This human tape worm is made up of a head and segments. The segments are fertilized worms which contain a number of eggs. The posterior segments contain eggs capable of being developed, which, loosening themselves from the anterior segments and being ex-

pelled with the faeces, are taken up by swine having access to the same. The eggs still remain fertile even if the segments have been destroyed by putrefaction. In the stomach of the pig the egg shell is dissolved by the gastric juice. In the intestines the egg is developed (embryo), bores through the walls and lodges in the muscles. If the embryo has found a suitable lodging place it gradually forms into a vesicle on the inner wall of which the head is developed. After three weeks this vesicle is the size of a pin head and the head is indicated by a mere dot. In six weeks the vesicle is as large as a mustard seed and the head can be easily recognized. In nine weeks the vesicle is as large as a pea and the head as large as a pin head with hooks and suckers completely formed; after three months the neck is also developed, and the measle worm

Muscle of Pork containing Larvæ of Taenia Solium. (Leuckart).

FIG. 13.

Head of Taenia Solium side view. (Leuckart).

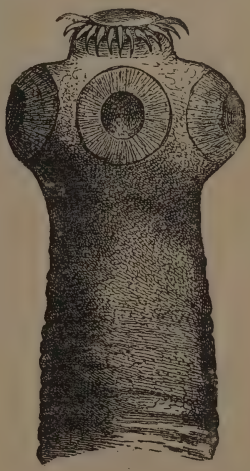


FIG. 14.

is capable of reproduction. It encloses itself in a connective tissue capsule and lies dormant until the death of the animal or until it is slaughtered. If human beings partake of meat that contains these tape worms the head, the suckers and the hooks

of the worm adhere to the mucous membrane of the intestines, and form chains of segments which become mature and filled with eggs. The fully developed pork measle (cysticercus cellulosa) consists of a round bladder about the size of a pea, filled with a light transparent fluid and a white head about the size of a millet seed, turned inward. The bladder has a fine slippery, transparent membrane. Around this a second membrane is formed from the connective tissue of the organ in which the embryo lodged, which gives the measle a grayish, transparent color. The head to which the neck adheres has four suckers

Anterior view of Head of Taenia Solium. (Leuckart).

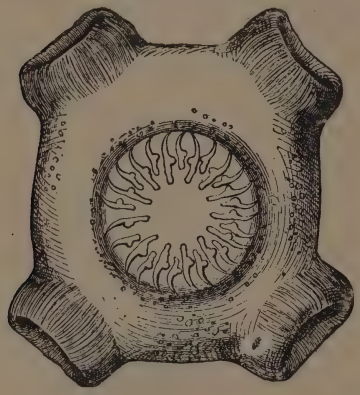


FIG. 15.

Pork Bladder Worm with head inverted. (Leuckart).

An isolated Pork Bladder Worm with Head everted. (Leuckart).

FIG. 16.

Hooks of Pork Tapeworm. (Leuckart).

FIG 17.

FIG. 18.

and a central prong of rostellum, with a double crown of from twenty-four to thirty hooks (see Figs. 13-18). The measle worm in all stages of development can die or calcify. In some in-

stances one or two may calcify while the remaining ones continue to develop. In swine the measle worm is found very frequently (about 0.3 per cent) in poorly regulated districts, but not so often in well regulated ones. Meat inspection greatly aids in the prevention of the spread of tapeworms and measles. As a rule pigs under six months become infected with the tape worm eggs. Cases have been observed where infection took place in animals a year and a half old, or over, in which case the worm was scarcely nine weeks old. Infested swine as a rule, show no marked symptoms during life. The presence of the measle in swine during life can only be occasionally observed, if individual cysts are found on the visible mucous membrane of the eye, mouth, or on the tongue.

Generally upon post mortem the flesh and organs are not changed by the presence of the measles. Sometimes, however, the muscles are watery and have a grayish color caused by numerous invasions.

The measle can be distinguished from trichina, which infests the muscle fibres, by its presence in the connective tissues and therefore may exist in all parts of the body. Its favorite seat is in the connective tissue of the muscle fibres. The muscles which are most frequently affected are the muscles

Muscle of Beef containing Larvæ Taenia Saginata. (Leuckart).

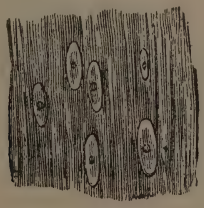


FIG. 19.

of the abdomen, heart, larynx, pharynx, tongue, nap of the neck, diaphragm, neck, the intercostal muscles, the muscles of the thigh (the inner surface). Incision into these muscles must be made in every case to ascertain the presence of the measle worm. It may happen that no measles will be found

in the muscles mentioned, whereas, other muscles which seldom are infected will contain them. **The measle is seldom** found in the liver, lung, intestine, etc., while the fat, brain, lymphatic glands and the like are often a favorite seat. It is very difficult to detect the measle in fat because the cell of the worm is almost the same color. The presence of the measle on the tongue is a diagnostic agent for this disease during the life of the hog. Cast the animal, place a stick in its mouth, pull out the tongue, and examine the under surface carefully. (This is quite an inhuman method and is not practiced in the United States, and is subject to a fine if practiced in some parts of Europe. A. T. P.)

Portions of an adult Beef Tapeworm Tænia Saginata. (Leuckart).

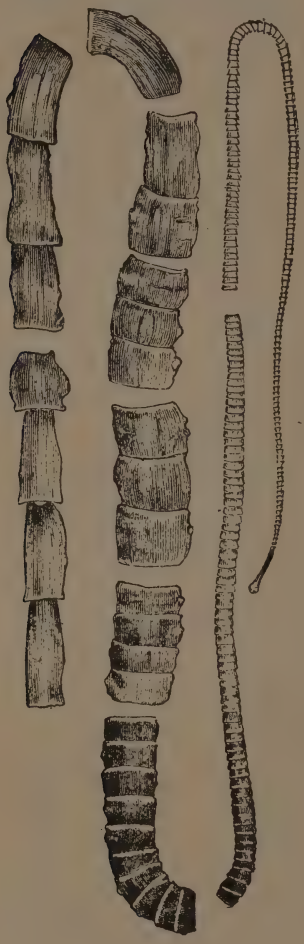


FIG. 20.

The tape worm (taenia solium) develops itself only in man and the larval form (cysticercus cellulosae) in swine. **It is also** stated that the measle of swine develops in other animals (dog and deer). **The taenia solium is** especially dangerous for the mature tape worm eggs may develop into the bladder worm in man. This occurs in the following manner. Through the rotary movement of the human intestines, in which the taenia solium lodge, segments, and mature eggs, or matured eggs alone, enter the stomach where the

gastric juice dissolves the shell. Self infection is also possible and may occur in the following manner. One who has a tape worm may, after evacuation, soil his fingers with faeces containing tape worm eggs which, when on the fingers, may gain entrance into the stomach with food. Besides developing in the human muscles the measle also develops in the brain and eye.

Abattoir inspection. All cases of pork measles should be condemned.

Head of Beef Tapeworm. (Leuckart).

FIG. 21.

2. THE MEASLES IN THE OX are the larval form of the tape worm, taenia inermis, or taenia saginata or saginata, which is found very often in man, and in comparatively few cases in cattle in a slight form. In not a few cases the most painstaking examination may reveal but a single taenia in the whole body. The development of the beef measles is the same as that of the measle in pork. Cattle become infected by partaking of matured segments or eggs in excrement; these eggs develop into cysts which, if taken into the human system, will become tape worms. In eighteen weeks the beef measle is fully developed and it continues to grow for about twenty-eight weeks. The adult tapeworn is usually a little larger and longer, and after a time looks a little grayer

than the pork measle worm. The head of the beef worm differs from that of the pork worm in not having the rostrum and double crown of hooks, but besides having the four suckers it has an extra one on the upper part of the head (see figure 21). The beef measle (cysticercus Bovis) is found in the very firm connective tissue, which is fairly thick and sinewy and through which the measle has a white color. It is found caseated or calcified more often than in swine, in all stages of development, especially those in the muscles of the bowels (heart) have a tendency to decompose, caseate or calcify, but this may also occur in the muscles of the jaw. If the worm is alive the contents of the cyst are clear and transparent, whereas, if they are turbid, the worm may be dead. A positive diagnosis as to whether the worm is dead or alive can only be made by a prolonged microscopical examination whereby the parasite is kept at body temperature.

The favorite seat of the beef measle is in the masseter muscles, which should always be cut into for examination. The next is the heart, then the tongue, whereas other parts of the body (neck, breast and other muscles) are seldom affected. The live measle can be easily recognized; the bladder is about the size of a pea and filled with transparent fluid. At a point in the wall of the cyst is the invaginated head which may be pressed out and upon microscopic examination the head and the suckers without hooks will be seen. It must be remembered that measles upon the surface may easily become irrecognizable by evaporation of the fluid contents. It might be mistaken for the echinococcus polymorphus (see page 175). These, however, are round and have either no or several heads provided with hooks. The beef measle worm can be distinguished from the thin necked bladder worm by the presence of calcareous particles.

Abattoir inspection. Meat infected with the pork as well as the beef measle is injurious for food, because in both cases tape worms develop in the human beings and cause untold agony. The pork measle is much more dangerous as it may by self-infection give rise to the same disease in man; therefore,

all measly flesh is injurious which has not been previously cooked. It is also known that by prolonged pickling the bladder worm shrivels up and dies and it has also been proven that the beef measle only remains virile for three weeks even if the flesh has not undergone preparation (cooking, smoking, pickling).

"Disposition of measly pork. (See disposition of measly beef.) Since taenia solium is more dangerous than the taenia saginata the regulations concerning the disposition of measly pork should be even more rigid than those concerning measly beef. Pork of this character can of course be sold under declaration, but even this is not advisable unless the meat is first rendered non-infectious." (During the year 1889-90, Berlin, Prussia, found 373 cases of alleged single infection; of these 56 cases were afterward shown to contain more than one parasite). It should be treated the same as moderate infection. In very heavy infections (up to 20,000 bladder worms may occur in a single carcass) the pork is watery and pale; it decomposes easily, and has a disagreeable sweet taste. Such cases should, of course, be condemned to the tank.

Cooking.—According to Perroncito, C. cellulosae dies at 45 to 50 C. (113 to 122 F.). It dies in one minute at 50 C.

Storage—Living specimens of C. cellulosae have been found in pork twenty-nine days after slaughtering (Railliet). After fourteen to nineteen days of cold storage at 10 to 15 C. the parasite is said to be dead; the protoplasm has become viscid, bluish opaque, and the hooks have fallen. More observations are needed upon this subject.

Disposition of measly beef. Measly beef should be condemned to the tank as unfit for food when the infection is general, or when the invasion by the parasites has caused a watery and flabby condition of the meat. In cases of light infection the meat can be used for food after the cysticerci have been rendered harmless, but even in these cases it is well to cut away the most heavily infected portions. Cases of so-called "single infection" should be treated the same as cases of

light infection, for although it may unquestionably happen that the animal is infected with but one bladder worm, still the finding of only one parasite is no proof that other parasites are not present; furthermore, in a number of cases of alleged "single infection," later and more thorough examination has revealed more worms.

In case of infection with only young parasites, in which the suckers are not fully developed, the meat may safely be passed and allowed to go on the market without restriction.

In case of infection with fully developed bladder worms, the meat should be subjected to some safe-guarding method before being placed on the block, or it should be sold under declaration of its exact character.

Opinions differ as to the method which should be followed in case of infection with degenerated bladder worms. It is maintained by some that this meat should be allowed on the market without restrictions. The finding of degenerated cysts, or bladders, however, is no proof that all parasites are dead, for not only are cases more or less frequently found in which both live and degenerated bladders are present, but even if the cyst or bladder is degenerated the head may, in some cases, still retain its vitality. It is accordingly safer to treat carcasses with degenerated cysts in the same manner as carcasses with live cysts; and should any exception to this be made, such exception should be limited to cases in which the degenerated parasites are found in the muscles of the jaws.

The cysticerci may be killed by cooking, salting, or corning, or by cold storage.

Cooking. This is the surest method of killing the parasites, but it is open to serious practical objections, for according to estimates, cooking in a steam sterilizing apparatus results in a shrinkage of from 33 to 50 per cent, and this heavy loss will undoubtedly be a drawback to its general use.

Perroncito found that below 30 degrees C. the movements of the worms are very slight, or practically nil; from 36 to 38 degrees C. the movements are livelier; at a higher temperature

they diminish, ceasing at 44 degrees C.; they "die sometimes at 44 degrees C., now and then at 45 degrees C., and always at 46 degrees C." He "therefore concluded that they could in no case survive 47 degrees C. and 48 degrees C. (=116.6 to 118.4 degrees F.) when they are maintained at this temperature for at least five minutes."

"Cold storage. Perroncito maintains that cysticerous bovis dies fourteen days after its host has been slaughtered. More recent investigations by Ostertag, Zschokke, Glage, and others have shown that two weeks form too short a limit, but that none of the worms can survive three weeks; beef-measly meat which has been in cold storage for three weeks may therefore be looked upon as harmless. In view of the recent investigations, I can see no reason why light cases of beef measles, but not pork measles, which have remained in cold storage three weeks, should not be passed as first-class meat and allowed to go on the open market without further restrictions. During certain seasons of the year, however, there is a practical objection to this method of safeguarding which has thus far been overlooked (except by Friis). Experience has shown that meat which has been in cold storage for this length of time during the summer will spoil much more rapidly when taken out of the cooler, than meat which has been placed in the ice box only long enough to cool and "firm." (From Bulletin No. 19, Bureau of Animal Industry, p. 81 and 94.)

(Beef measles are extremely rare in cattle raised in the United States. S. S.)

3. OTHER BLADDER WORMS.

Dogs are infested with different species of tape worms as in man of which the cystic larval or measles are found in the different meat producing domestic animals. These cysticerci, which have various names, differ from the beef measle (cysticercus bovis) and the pork measle (cysticercus cellulosae) in as much as they cause no damage or disturbance if taken into the human system. Tape worms do not develop from these cysts excepting in dogs and, therefore, are not injurious

to man. They are of no importance to meat inspectors, but they should be familiar with them, so as to distinguish them from the beef and pork measle, and if any organ should contain such vast numbers that they cannot all be removed, it is unfit for food. One of these cystic forms (echinococcus) is of special importance as it develops in man according to the location (brain, liver, heart and the like) and is injurious and even dangerous to life. The following are of importance to the meat inspectors:

First, the bladder worm of the brain (coenurus cerebralis); second, the thin long necked bladder worm (cysticercus tenuicollis); third, cysticercus pisiformis; fourth, echinococcus polymorphus.

1. THE BRAIN BLADDER WORM (coenurus cerebralis) infests the brain of sheep, seldom the spinal cord, which causes the so-called "gid" or "turnsick." Isolated cases have been found in horses and cattle. This worm is of little importance to the meat inspector, as it would be very impractical to open the skull of each sheep, or to examine each spinal cord, simply to ascertain the presence of this parasite which is perfectly harmless to man. If noticed it should be destroyed in the interest of the farmer and stockman.

2. THE THIN LONG-NECKED BLADDER WORM (cysticercus tenuicollis) originates from the tape worm of the dog (taenia marginata) and exists under the pleura and peritoneum as well as on the serous membranes of the thoracic and abdominal organs, on the omentum and pancreas of sheep, swine, cattle, and other animals. The vesicles or cysts lengthen in the direction of the head, show transverse folds and may become as large as a pear. The thin long necked bladder worm may be found in the internal organs, but, as a rule, it is calcified. In the liver these elongated cysts have a brownish or green color and indicate the direction these parasites have taken. It is not injurious to man and has no appreciable influence on the organs, because it lives on the serous membranes and can very easily be removed without injury to the organ

itself. These parasites should be removed and destroyed in the interest of the farmer and stockman, but the organs may be used. The cyst of the thin long necked bladder worm, when very small, may very easily be mistaken for the pork and beef measle worm. It can easily be distinguished from the beef bladder worm by its head having a proboscis with a crown of hooks and from the pork bladder worm by its form (a long neck which is very prominent, after the connective tissue has been removed) and the hooks are very numerous. (Figs. 27-35.)

"So far as the question of using beef, mutton, or pork from animals infected with cysticercus tenuicollis as food is concerned, this parasite is of no importance whatever; for although several authors have attempted to infect themselves with tape worms by swallowing this larva, all such experiments have been negative." (Bulletin No. 19, Bureau of Animal Industry.)

3. CYSTICERCUS PISIFORMIS is the cystic stage of the taenia serreta of the dog and the cysts developed on the serous covering of the lung, liver and peritoneum of rabbits. It very often degenerates and may be mistaken for tuberculosis.

4. ECHINOCOCCUS POLYMORPHUS, usually called a water bladder, originates from the taenia echinococcus of dogs. This worm is found in large numbers in the small intestines of dogs and is so small (4-4,5 mm) that it is very often overlooked. On the contrary the echinococcus cyst, which is found in all the organs of herbivorous animals, also in swine and man, very often attains the size of a man's hand or larger, or again it may only be the size of a pea or smaller. It is distinguished from other bladder worms, not only by its various sizes, but also by the following different forms: (a) a simple bladder, (b) hydatid echinococcus, a large cyst containing smaller vesicles, (c) a multilocular echinococcus, numerous vesicles separated from each other by connective tissue. In all three forms heads may be present, or absent. Cysts without heads are not fertile and therefore cannot develop into tape worms. These cysts may be found in one, several, or all organs of an animal. In some cases the entire organ is involved, especially the lung

or the liver. The liver particularly often attains an enormous size and weight (in cattle 100 pounds).

"Frequency of the hydatid in various animals. The frequency of hydatid varies greatly in different countries. According to statistics thus far published the parasite appears to be most frequent in Iceland, India, Eastern Siberia, and Australia; it is more common in Mecklenburg than in any other part of continental Europe. The United States seems to be comparatively free from hydatid infection, although the disease is apparently on the increase.

United States. "I have seen cases of hydatids in this country in cattle, hogs, the camel, and man, but as yet have seen no cases in sheep. Wheeler records 117 cases of liver echinococcus in 2,000 hogs examined in New Orleans; the cases of domesticated animals which I have examined came from the District of Columbia, Missouri, and Nebraska; Welch records it for Maryland and several of the Bureau inspectors report it from various abattoirs." (Bulletin No. 19, Bureau of Animal Industry.)

The author (Fischoeder) claims that the echinococcus is found as often, if not more so, than tuberculosis. The organs most frequently affected are the lungs and the liver; but they may be found in other organs, especially the spleen in rare cases. The echinococcus polymorphus may suppurate, caseate, or degenerate, and in this form can very easily be mistaken for tuberculosis. If this condition is caused by the hydatid, which when caseated is tough and elastic, the corresponding glands as a rule, are not affected and the caseated mass is easily separated from the smooth connective tissue of the cavity. In pressing the hydatid between the fingers a thin slippery skin will be retained, and uninjured cysts will always be found on the border near the caseated, degenerated hydatids; whereas in tuberculosis the corresponding glands are always affected, the nodules are ingrown, not easily separated and have either a firm, dry, or pus-like consistency.

Abattoir inspection. The echinococcus polymorphus can-

not be directly transmitted to man and is therefore not directly injurious, but to prevent its spreading among animals and to avoid any possible contamination they should be carefully removed from the organs and destroyed, but under no circumstances put within the reach of dogs. The ruling to American meat inspectors is as follows:

"Organs affected with echinococcus are not directly harmful to man as food, since the parasites will not come to maturity in man's intestines, and there is no objection to placing these organs on the market after the portion containing the parasites has been removed. Removing and destroying the infected portions are precautions which should always be taken in order to prevent the possibility of the further infection of dogs.

The abattoir is the proper place to attack this disease and a careful and persistent destruction of the larval stage found in meat inspection must finally result in lessening and even exterminating the disease. Heat should be used in destroying the parasite." (Bulletin No. 19, Bureau of Animal Industry, by Dr. Stiles.)

4. TAPE WORMS.

Tape worms are also found in the intestines of our meat producing animals as in man and dogs. They are of very little interest to meat inspectors. The intestines are not altered by the presence of the tape worms, so that they may be used after a thorough removal. As a rule, the flesh is not affected either, so that it may be allowed to pass. Tape worms in the intestines of sheep cause emaciation and a watery consistency of the muscles and a carcass in this condition is unfit for food.

The tape worms mentioned include the broad tape worm (taenia expansa) of sheep and cattle; the taenia denticulata of cattle; the taenia plicata; taenia perfoliata; and taenia mamillana of horses, and the foregoing tape worms in the dog. (Taenia alba of sheep and cattle and the taenia fimbriata of sheep.)

5. ASCARIDES.

This species is a round worm of different lengths and thickness, curved and pointed at both ends. The larval form is not known. It exists in the intestines of animals and, as a rule, without any disturbance to the same or the flesh. The inspection is the same as that of tape worms. Under this head may be classed the ascaris lumbricoides found in cattle and swine and the ascaris megalocephala in the horse.

6. OTHER PARASITES IN THE DIGESTIVE ORGANS.

Many different kinds of parasites are found in the alimentary canal of meat producing animals.

(a) Sclerostomes and palisade worms (in horses). The larval form (strongylus armatus) of this parasite lives in the anterior mesenteric artery and produces enlargements and hemorrhages which may cause colic and eventually death. In sheep the worm (strongylus contortus) causes verminous gastritis, which leads to anaemia and a watery consistency of the muscles.

(b) The spine headed worm (echinorhynchus gigas) found in the intestinal tract of swine is of little importance to meat inspectors. The strongylus convulutus is the only one of importance. It is from 7-13 mm in length and is found in the stomach of cattle. It lies in clusters in the mucous membrane of the stomach, in the form of very small spots and is very common (90 per cent of all slaughtered cattle). Numerous invasions are harmful to young cattle in which it causes emaciation and a watery consistency of the muscles.

The flesh should be looked upon as unfit for food and sent to the tank.

(c) Different species of the larval form of the bot fly (gastrophilus Equi) are found in horses. (a) On the walls of the stomach (Gastrophilus Equi). (b) In the grandular part of the stomach and small intestines and under the skin of cattle (Hypoderma Bovis.) (c) In the small intestines (Gastrophilus Nasalis) found in the nose of sheep. They are round in the form of a cast and bore into the mucous membrane of the

stomach and intestines to which they adhere. From June to August, or from May to October, they are passed with the faeces. These parasites are of little importance to meat inspectors as they do not affect the meat; but it may happen that suppurating masses will form, which might invade the abdominal cavity and cause peritonitis.

7. WARBLE OR GAD FLIES.

(a) The larval form of the oestrus bovis is found in cattle under the skin of the back, shoulder, and the side of the breast in swellings. As a rule they are in the form of nodules with a watery consistency of the surrounding muscles. Soon after skinning these parts have a greenish-yellow gall-like color and must be removed, for they are very injurious.

(b) The larva of the oestrus ovis is found in the nasal sinuses of sheep where it causes inflammation and irritation (nasal catarrh). They are of little importance to inspectors.

8. LUNG WORMS.

In the lungs of domestic animals there are found numerous worms, especially palisade and thread worms. These worms live in the trachea and bronchial tubes. In coughing animals expel fertilized eggs which probably develop in the ground and the young brood is taken up, either in water or in food in spring time. Further developments occur in the lungs, where they cause, in the fall, the symptoms of chronic or acute inflammation of the lungs or bronchial tubes. This, however, is the case only in sheep after a large invasion, whereas, they do little damage in other animals. Under this class may be named the following:

1. In sheep and goats; the thread worm (strongylus filaria) and the lung worm (pseudalius ovis).
2. In pigs; strongylus paradoxus.
3. In cattle; strongylus micrurus.

Symptoms: The presence of these strongyli in the lungs is indicated by pearly shining nodules, which upon incision reveal the eggs and worms and which are found in the slimy contents of the somewhat enlarged bronchial tubes. The connec-

tive tissue of the lungs is somewhat thickened and free from air. Acute inflamed nodules may be found which later on end in suppuration. In sheep the pseudalius ovis causes distinct pathological changes. At first gray or grayish-yellow nodules form in which the egg and embryo are enclosed. Later on these nodules vary in size from that of a pea to a walnut, and are surrounded with thick connective tissue. In the center of these nodules are found dead worms which look turbid, white or yellowish, similar to the tubercular nodules. The entire lung is very often involved in which case the lung is enlarged and degenerated. In swine the worms (strongylus paradoxus) are usually found at the point of the lobes on the surface of which the pearly nodules will be seen. About one-half of all swine are affected with these worms and therefore in all swine the tips of the lobes should be cut into. Upon incision large clusters of these worms are found in the nodules. The lungs show no other pathological changes besides these nodules. In making an incision into the lobe of the lung these young thread worms may adhere to the blade of the knife, and in this way may contaminate samples and which at first sight may be taken for trichina. (See page 236.)

Abbatoir inspection. These parasites are not transmissible to man and therefore the affected lungs are not injurious, but and in the worst form of the disease the muscles and bones should be condemned as unfit for food. In swine it is only necessary to cut off the affected parts of the lobes. If during the course of the disease the animal has emaciated, which is often the case in sheep, or the flesh is watery, the carcass should be confiscated.

9. LIVER FLUKE.

There are two kinds of liver flukes:

(a) The large fluke (Distomum hepaticum) is a leaf-like, flat, long shaped worm with its posterior extremity wedge shaped, about 4 cm long and 1 cm broad. (See figure 22.)

(b) The lancet shaped fluke (Distomum lanceolatum) is much

smaller than the above, and narrower in proportion to its length. (See figure 23.)

(a) Life history of the distomum hepaticum. The eggs of the fluke are found in the faecal matter and under favorable temperature and moisture a spine covered embryo is formed which lives in snails (Linnaeus). This larva is transformed in germ cells which produce the future cercaria. In these germ cells a brood is developed (attenuated cercarian). They are very minute parasites which live free in water or on marshy ground, where they become encysted on weeds or blades of grass, and are swallowed by animals. Infection takes place in the summer and fall until the first frost. Damp pastures should therefore be avoided. From the stomach they pass into the intestines and then either through the intestinal vein or through the biliary passages into the liver; or they may bore through the walls of the intestines into the abdominal cavity and thence into the liver. From the liver they spread through the biliary passages, or they may bore through the same into the connective tissue of the liver or its veins, thus entering the blood, whereby they are carried to other organs (lungs, etc.). In the liver they become fertile and produce eggs which are passed with the faeces. A single egg may produce as many as 1,000 flukes. The fertile distome wanders or migrates out of the liver back into the intestines, but numerous distomes may be found in the liver at most any time of the year. Flukes may degenerate or calcify in any organ, but especially in the liver. The pathological changes are, as a rule, in the liver itself and are dependent upon the presence of the fluke in that organ. Isolated flukes are usually harmless. The bile ducts and the liver usually show no changes and in a normal appearing liver an isolated fluke may be located by incision and pressure on the bile ducts. When infection is extensive the bile ducts are greatly thickened; they degenerate and show on the surface

Distoma Hepaticum (Leuckart).

FIG. 22. (Natural Size.)

in white or yellowish-white streaks involving the whole liver, terminating in the gall bladder. Upon incision hundreds of flukes will flow out with the bile from the ducts. The pathological changes, if any, can very easily spread as new connective tissue is formed, which compresses the liver, thus causing the entire organ to become enlarged and hardened.

(b) The lancet shaped fluke, which is not as frequently found as the large fluke, as a rule, causes no pathological changes or disturbances, even if present in large numbers, especially in sheep. To determine its presence an incision must be made into every liver, whereby a dark brown, thick fluid, which upon close examination, contains great numbers of these parasites, will exude from the gall ducts. In some cases large flukes will bore through the gall ducts, which in passing through the liver tissue cause hemorrhages in that organ which indicate the direction the parasite has wandered. The hemorrhages leave connective tissue-like scars, suppurating nodules are very seldom found. It may happen that a fluke will lodge in the abdominal cavity and cause peritonitis. Flukes are very frequently found in cattle, especially those that have been grazing in damp pastures. A general disturbance is noticed only when the entire connective tissue is hardened; the animal then emaciates. It seldom causes a watery consistency of the muscles. Thickened and newly formed tissue is found in the liver. Some years flukes are more numerous in sheep than in cattle and cause hemorrhages, thickening of the gall ducts, cirrhosis as well as emaciation and watery consistency of the flesh and often cause the death of large herds.

Distoma Lanceolatum (DeWetz)

FIG. 23. (Natural Size).

Distomes are seldom found in goats and without any general disturbances. Isolated distomes may be found in the lungs, enclosed in a hard capsule, with a dark brown turbid fluid in which are degenerated distomes. They may also be found in other parts of the body, such as the muscles, the spleen and cutis. Liver flukes are rarely found in swine.

Abattoir inspection. It is necessary in every examination to make an incision into the upper surface of the right and left lobes crosswise to the biliary passages (as shown in figure 2). Flukes are not injurious to health, but those parts which contain them should be removed. If no pathological changes are found in the liver itself, the fluky gall ducts can be cut out and the liver allowed to be sold. This is the rule in Europe. If the meat is watery, especially in sheep, it is condemned and tanked. (See page 185.)

The following are the rules given in Bulletin 19, Bureau of Animal Industry by Dr. Stiles:

"Fluke animals as food. If only a few flukes are found in the liver and these have not caused any extensive pathological changes, there seems to be no valid reason for condemning the entire organ as food, for the eggs would be perfectly harmless if eaten; the adult parasite, if swallowed alive, might cause some temporary injury, but as liver is well cooked in this country, there is scarcely any chance that the adult worm would be swallowed alive; if the pathological change is confined to a portion of the liver, that portion can be cut out and the rest may be used for food; in case of a general cirrhosis, or in case of suppurating inflammation of the tissue, caused by the wandering of flukes through the same, the liver should be condemned to the tank. There is generally no particular alteration to be noticed in the flesh of fluked cattle, unless the liver is very far gone, in which case the meat is more "flabby" and lighter than usual. In case of a badly fluked sheep, the flesh is of a very poor quality and contains but little nourishment; it is pale and "flabby," and according to European authors it should not be placed on the market in case the sheep have passed Gerlach's second stage of the disease."

10. PENTASTOME.

This worm lives in the nasal cavity of the dog and is of little importance to meat inspectors excepting its larval stage (pentastomum denticulatum) which is found in the pancreas, liver, lungs, spleen and peritoneum in cattle, sheep and game.

The Pentastomum denticulatum is white, smooth and transparent, from 4 to 5 mm long and at its broadest 1 to 3 mm wide. It has two slit-like openings on each side of its mouth, which are provided with two hooks. The pathological changes in the glands of the pancreas are various. Round or irregular nodules varying in size from that of a millet seed to a pea are most frequently found. They have a yellow, green or gray color, and are situated on the border of the lymphatic glands. The yellowish nodules are soft, the green caseated, and the gray degenerated. In the first two unchanged parasites are found, and in the gray nodules they are generally calcified or degenerated. Encapsuled nodules sometimes form in the liver and other organs, but not in the pancreas. These parasites are of no importance to the meat inspector excepting that they are found in the pancreatic and lymphatic glands of cattle and may easily be mistaken for tubercular nodules. Besides a microscopical examination the nodules may be distinguished by the following characteristics:

Tubercular nodules, when caseated or calcified, look yellow; whereas caseated pentastomum nodules are green, and calcified ones are gray. Yellow pentastomum nodules are not caseated nor calcified, but are degenerated. The pentastomum denticulatum is not directly harmful to man, but in dogs the pentastomum taenioides is developed from it, which will again produce the denticulatum in dogs and as this is also found in man it is important that all parts containing these parasites should be destroyed, so that no dogs can be infected.

XIII. PATHOLOGICAL CHANGES OF THE BLOOD.

There are a number of diseases among domesticated animals caused by abnormal conditions of blood. They are of no importance to inspectors, excepting when the condition of the animal is impaired, or when the flesh shows grave pathological changes, in which case it must be looked upon as unfit for use. The cause and symptoms during life are of little conse-

quence; the condition of the flesh being the principal feature.

1. ANAEMIA.

The term anaemia means a deficiency of blood, which is especially caused by parasites (lung, stomach, intestine and liver worms) or chronic and acute diseases which tend to lessen the quantity of blood.

Symptoms: During life the animal manifests great weakness and drowsiness, has very pale mucous membranes, flabby muscles, impaired appetite, etc. When slaughtered the animal has but a small quantity of blood, which is not very red and does not coagulate readily. The organs, as a rule, are not changed. There is no reason why the carcass cannot be used excepting when the animal is greatly emaciated, in which case it is unfit for food. A particular form of anaemia accompanied by fever is often fatal. Upon post-mortem examination the internal organs and the muscles are swollen, look pale, and have undergone fatty degeneration. The cause of this disease is not known and is seldom found in slaughtered animals. Although it has not been proven that the flesh is injurious, yet for safety it should be confiscated.

2. EMACIATION.

Extreme emaciation from any cause so modifies the tissues that the carcass does not become firm and dry in the refrigerator, like normal flesh, and accordingly is very deficient in nutritive qualities and should be rejected." S. S.

3. GENERAL DROPSY.

This disease is the result of a severe case of anaemia, when the animal is greatly emaciated, especially sheep and young cattle. Besides the symptoms of anaemia swellings which leave finger impressions, but are not sensitive or inflamed, appear on the legs, abdomen and breast, also on the head and neck.

Upon post-mortem examination a serous fluid is found in

the cavities (thoracic, abdominal and pericardial). The flesh of such animals is saturated with water, which in many cases literally drips from the flesh; not a sign of fat will be found in the muscles or organs, but instead a putrid serous fluid. The muscles are flabby and do not contract, have a grayish-red, or brick-red color, soon turn dark and when the water is drained off they become smeary. In some cases the muscles are not so thoroughly saturated with water and after twenty-four hours show no signs of it. In this case the muscles still have a normal appearance, are not flabby and traces of fat will be found. This mild form of dropsy not only occurs in cattle that are fed on sugar beets, but also in the ox and sheep.

Abattoir inspection. In mild cases of dropsy when the muscles are not discolored and after twenty-four hours look dry and normal, the flesh is sold as unsound; in severe cases, condemned. (In this country all carcasses which are extremely emaciated and which show a watery condition of the muscles are condemned. A. T. P.)

4. LEUKAEMIA.

This is a disease of the blood characterized by an increase of the number of white blood corpuscles. The blood is pale and coagulates slowly. Instead of a coagulated mass in the heart and large blood vessels there will be yellowish-gray or pus-like masses, which are soft and smeary. Besides these there are pathological changes in the organs and lymphatic glands; the spleen especially is very much enlarged, more firm and of a lighter color. The follicles of the spleen vary in size; some being as large as a pea. The lymphatic glands are also enlarged and the bone-marrow increased, and lighter in color. White nodules will also be found in the liver, kidney, lung and on the serous membranes. In some cases there are hemorrhages in the external skin and in the mucous and serous membranes. There are cases in which the spleen, lymphatic glands or bone-marrow will be principally affected.

Abattoir inspection. Although it has not been demonstrated

that the flesh of animals affected with leukaemia is injurious to health, yet it should not be used for human food, because the disease also occurs in man.

"Leucocythemia or lukemia is occasionally found on the slaughter beds. Enlargement of the lymphatic glands and the spleen are abnormities which attract the attention of the meat inspector. In the several cases coming under my notice the animals were thin in flesh, presenting the appearance of general unthriftiness. The spleen is many times the normal size, and the lymphatic glands in all parts of the body were from two to ten times the usual dimensions, cross section of which presented a nearly normal appearance. In well marked cases condemnation is indicated.

Non-specific inflammation of every viscus is occasionally found and the disposition of the carcass must be determined by the stage of development and the extent and character of perverted functional activity. It is conceded that high bodily temperature, long continued, impairs the quality and character of flesh, renders it unappetizing, noisome and suspiciously unwholesome.

Acute inflammation, as well as chronic structural changes of the kidneys are quite apt to escape notice, owing to these organs being embedded in considerable fat. Any considerable interference with the renal functions soon leaves the tissue charged with waste products, which prevent the usual firming of the flesh, it remaining soft and sticky or clammy to the touch and giving out a loathsome odor. Such flesh should be condemned." S. S.

5. JAUNDICE.

Jaundice is a yellow discoloration of tissues due to swellings of the bile ducts (from catarrh of the small intestines, gall stones, parasites, etc.), whereby the bile instead of entering the intestines is taken up by the blood. Jaundice may appear

as an accessory to other diseases in which there is a degeneration of the red blood corpuscles.

Symptoms: The yellow discoloration appears in the liver, kidney, connective tissue, skin and mucous membranes. In severe cases the cartilage, pleura and peritoneum are yellow and discolored (greenish or whitish-yellow). The yellow color of the fat of animals fed on grass or maize must not be mistaken for jaundice. In this case the fat only is yellow, while all other parts have their normal color. It is also to be borne in mind that jaundice can only be diagnosed by daylight; artificial light gives all animals affected with this disease a white appearance. In very extensive cases of jaundice, animals, especially swine, often look white in daylight. As a rule healthy swine can be distinguished right after slaughtering by the pink color of the fat, which is absent in affected ones. In doubtful cases it is advisable to compare suspected animals with healthy ones. An authorative opinion should not be made until twenty-four hours after slaughtering; in mild cases the yellow color almost entirely disappears. In more severe cases it remains the same, and in its worst forms it is either a darker yellow or white. In removing the entrails it often happens that the gall bladder is injured, causing the contents to contaminate the inner walls of the abdomen and thorax, also the neck. In such cases the upper layers are discolored, which can be easily verified by making an incision into the same. Sometimes, especially in swine, there is a yellow discoloration on the ham and in the region of the shoulder caused by an injury, a sprain, or a broken bone in those parts.

Abattoir inspection. Mild forms of the disease are allowed to pass, but in very extensive cases the flesh is condemned. (See ruling of the Bureau of Animal Industry.)

6. BLOODY URINE.

By this term is meant a decomposition of the blood in which the coloring matter of the blood is voided with the urine. The disease is seen especially in cattle and horses

which are pastured in pine forests, although it is often caused by other plants, or a severe cold.

Symptoms: The urine has a reddish color; the animal has a poor appetite and is weak in the back. On slaughtering the blood is found very thin and cherry colored. The mucous membrane of the stomach is swollen and inflamed, while the organs are usually not changed. In rare cases jaundice, or a flabby, pale condition of the muscles will be found.

Abattoir inspection. If a slaughtered animal shows the above symptoms it is best to consult a veterinarian, because in many acute diseases the blood is decomposed and the disease not easily distinguished by an inexperienced person. If there are no other changes than those in the urine the flesh may be used. (See Chapter on Texas Fever.)

7. RETENTION OF URINE.

When the flow of urine is hindered by accumulations of urinary calculi, which is especially the case in oxen and bucks on account of the "S" shaped curvature of the penis, the bladder often bursts or necrosis of the affected parts of the uretha sets in, in which case the urine is often voided into the abdominal cavity.

Symptoms: During life the animal appears very sick and indifferent and the exhaled air has a urinous odor. Upon post-mortem the blood, internal organs, and the muscles have the same odor. In mild cases the odor is scarcely perceptible, but it is again noticed in cooking the parts. Between the muscles under the skin there are often fluids which cause irritation and have a strong urinous odor. In cases where the bladder bursts the abdominal cavity is filled with urine and there is inflammation of the peritoneum.

Abattoir inspection. In mild cases where the odor is soon lost and not detected again in cooking, the flesh may be used. In severe cases it is unfit for food.

XIV. POISONING.

Poisoning very often occurs in domestic animals.

Symptoms: These vary according to the kind of poison taken up by the animal. The reader is referred to Friedberger & Frohner by Zuill p. 250 for a more detailed description. As a rule, sudden severe sickness with symptoms of great weakness, paralysis, cramps and the like suggest poisoning. The animals are usually killed. The pathological changes which are present upon post-mortem vary according to the nature of the poison. Poisoning by nerve poisons, such as morphine, strychnine, and the like, cause no pathological changes. Corrosive poisons, such as acids, arsenic, phosphorus and the like, cause inflammation, or intense irritation of the alimentary canal. In administrating medicines which have strong odors, such as petroleum, camphor, oil of turpentine and the like, the flesh will have the some odor many days after death. Some poisons, such as chloroform, chloride of lime, and the like, cause the blood to become thin and decompose. In still other cases of poisoning there is a septic condition of blood.

Abattoir inspection. The flesh of poisoned animals, as a rule, is not harmful to man, but the alimentary canal and the udder are regarded as injurious and should be destroyed. If there are no pathological changes in the flesh it is allowed to pass for food. If the blood has a gummy consistency, or the flesh has a faint odor of drugs, chemicals or malodorous plants, it should be stamped as spoiled.

Under auto-infection may be mentioned puerperal and milk fevers, which should be distinguished from septic puerperal fever (see pages 155-158), which runs a similar course and is recognized by putrid processes in the uterus and vagina; whereas in milk and puerperal fever there are no pathological changes in those organs and the excretions have not a putrid odor.

Abattoir inspection. In simple cases of milk fever the car-

cass is allowed to be used provided it is thus stamped. All cases of septic puerperal fever should be condemned.

XV. PATHOLOGICAL CHANGES WHICH MAY BE SEEN IN ALL PARTS OF THE BODY.

Of these there are a great number which are only of importance to meat inspectors inasmuch as they are the symtoms of severe general disturbances which make the meat unwholesome, for instance turbid swellings of the organs, necrosis, oedematous swelling, small hemorrhages on the cutis and subcutis and on the mucous membrane, pleura, peritoneum and the like. Pathological changes concerning the size (atrophy and hypertrophy) form (deformity) or accumulation of fat in different organs are of little importance. Such organs may be used. Some pathological changes in organs are judged as follows; to these belong:

1. DISCOLORATIONS.

In calves, and cattle at times, the lungs, seldom other organs (liver, membranes of the brain and spinal cord) and rarely all organs have a black color.

Abattoir inspection. Such organs are considered unfit for use. About one-half of all cattle, regardless of the skin color, have a part or the whole of the mucous membrane of the first stomach colored black. In this case generally the tongue also has black spots. These conditions are of no importance.

2. INJURIES.

As a rule hemorrhages occur after injuries. Blood found in any of the cavities is of no consequence to the meat inspector. If the tissue is saturated with blood, which is usually the case in fractures, the affected parts are unfit for food. Fractures (on the front or hind quarters) are very often overlooked in slaughtered animals (swine), especially when the fractures

occurred shortly before killing and when the hemorrhage is slight. In fractures of the pelvis the hemorrhage is always noticed on the inner side of the pelvic cavity. In fractures of the thigh-bone there is often seen a light blue or yellowish discoloration of the skin at the point of the fracture. This discoloration should always lead to a more thorough examination. In every case an incision for even slight hemorrhages should be made on the surface of skinned animals since extensive hemorrhages in deep connective tissue often extend to the subcutis. Swine suffer fractures during transportation, most frequently of the pelvis, thigh, shoulder-blade and also the forearm, or in other parts of the body. This is often the case when animals are transported in ordinary wagons. In injuries in general it is important to note whether they are in contact with the outer world or not, since in the former case complications may set in, such as septic inflammation and blood poisoning, especially if the injuries are in the cavities of the body (thoracic, abdominal, pelvic or cranial) or in any of the joints or bones. (See page 161.)

3. HYPERAEMIA.

This disease cannot be recognized in individual organs if the animal has been properly bled to death. On the contrary, in animals which die a natural death, or which are killed during the last struggles for life, the deepest saturated parts are filled with blood (hypostasis), which is a strong indication that the animal was not bled to death. If serum enters the connective tissue (oedema) or a cavity through impaired circulation, this condition will still be found upon post-mortem. The tissue has a jelly-like appearance. Organs thus affected should be condemned. Serum in any one cavity is of no importance if the flesh shows no abnormity.

4. INFLAMMATION.

Inflammation appears in all organs and in all parts of the body.

Symptoms: During life the inflamed parts are red, warm, swollen and sensitive and incapable of performing duty. Upon post-mortem only the swelling and the red appearance will be seen. The following divisions may be made according to the nature of the secretion:

(a) SEROUS INFLAMMATION only occurs in the tissues (serous infiltration), mucous membranes (catarrh), articulation, pleura, tendons, sheath, and peritoneum (accumulation of fluids). In the articulations, pleura and peritoneum, the fluids contain fibrine in the form of flakes, or very light easily removed tissue (profibrinous inflammation). It is important to note whether or not this inflammation has been in contact with the outer world and has assumed a pyaemic or septic condition. (See pages 152-256.)

Abattoir inspection. Parts affected with serous inflammation should be condemned.

(b) PURULENT INFLAMMATION. Pus forms which is usually localized, but it may also lead to general infection (See page 152.)

Abattoir inspection. If the disease is not generalized the parts affected should be confiscated.

(c) HEMORRHAGIC INFLAMMATION is preceded by great irritation.

Symptoms: The secretions are reddish and the affected parts very easily become necrotic.

Abattoir inspection. In some cases hemorrhagic inflammation has no detrimental effect on the flesh (swine plague, wild and rinderpest and pleuro-pneumonia). In other cases, on the contrary, injurious effects have been noticed (hemorrhagic gastro enteritis, purpura hemorrhagica in horses). It is, therefore, impossible to give a fixed rule in this disease. (See rules of the Bureau of Animal Industry.)

(d) CROUPOUS OR DIPHTHERETIC INFLAMMATION is seldom seen in animals and only on the mucous membranes. In croup the superficial cells of the mucous

membrane become necrotic and in diphtheria the mucous membrane proper affected. In both cases a white or yellowish-white coating forms on the mucous membrane, which adheres to the same and upon removal leaves either a bare surface or an ulcer.

Abattoir inspection. In many cases, for instance, in diphtheretic infection of the mucous membrane of the uterus, septic blood poisoning often sets in. The flesh should be condemned.

(e) CHRONIC INFLAMMATION, as a rule, occurs in visceral organs. New connective tissue is formed which causes more or less destruction of the organs. They are hard, and, in a great many cases, enlarged. It occurs in the liver, kidneys and muscles, as well as on the serous membranes, and is generally local.

Abattoir inspection. In mild cases these conditions are of no importance. If a large portion of an organ is involved the whole organ should be condemned.

5. PATHOLOGICAL GROWTHS.

These are distinguished as non-malignant and malignant growths (tumors).

(a) The non-malignant growths are of no importance. They either affect an organ but slightly or not at all, and do not involve other organs. These include the fibroma (connective tissue tumors, warts, nodules, polypi, etc.), fatty tumor, osteoma, lymphoma, etc.

Abattoir inspection. The organs may be used after the removal of the diseased parts.

(b) Malignant growths have a pronounced tendency to degenerate and spread, not only in the respective organs, but also in the whole system. The tumor continually grows larger and new nodules are formed in its vicinity which unite and have a ragged form. As a rule they degenerate and form ulcers. A malignant growth may originate in any organ and by the circulation or the lymphatics spread through the entire system. Carcinoma and sarcoma are the most important to

meat inspectors. Carcinoma occurs most frequently in older animals. It is very often found in the mammary glands of swine, from which it spreads to other organs (liver, spleen, kidney, etc.) by means of the lymphatics. The related lymphatic glands are always knotty, but never calcified as in tuberculosis. Sarcoma usually occurs in young animals. A favorite seat of this disease is the fourth stomach of cattle. The wall is firm and often five times its usual thickness and upon incision white or gray streaks will be seen. Quite often entire muscles (abdominal and heart) are sarcomatous. From the walls of the stomach the disease spreads to other organs (heart, kidney, spleen, lung, etc.). Dissemination occurs chiefly through the blood, but the corresponding lymphatic glands are also usually affected.

Abattoir inspection. Since Carcinoma and Sarcoma also occur in man the flesh and organs of affected animals should be looked upon as injurious, although it has not been proven that the disease can be transmitted from animals to man. After the removal of the affected organs the flesh may be sold. If nodules are found near the affected organs or muscles the flesh is very injurious and should be condemned. (In America extensively affected animals are tanked. A. T. P.)

XVI. IMPORTANT CONDITION AND SURROUNDINGS.

I. IMPERFECT BLEEDING.

This occurs in sick animals when the heart is too weak at the time of slaughter to expel the blood, and in healthy animals when they are killed during or after great exertion, such as being over-heated or exhausted. This is especially true of pigs, which, while being driven to the slaughter houses, escape and are caught after a long and tedious chase. If the animals

are transported on foot it will take twenty-four hours or even longer for them to overcome the exhaustion.

Symptoms: The veins of the cutis and subcutis in imperfectly bled animals are filled with blood, as well as the left ventricle. (See page 37.) The organs, especially the spleen liver and muscles, have a darker color and are watery and flabby.

Abattoir inspection. Imperfectly bled, healthy animals may be sold, but should be stamped. A simple diagnosis will not suffice; in every case the cause must be ascertained, since the carcass or the flesh of all improperly bled animals must be judged according to the nature of the disease.

2. NATURAL DEATH.

In determining whether an animal died a natural death or was killed during the last struggles, many difficulties arise, which are still more complicated if the animal was stabbed after death took place. This mode of dealing is termed "cold slaughter," and is practiced in order to dispose of dead animals. The flesh of animals that have died is recognized by the fact that it contains a great amount of blood; but according to this statement no boundary line can be made between emergency slaughtered animals and those that died a natural death. It is just as difficult to determine the nature of the slaughter by the extent of the stasis in the deep seated parts (of lung, skin, etc.). The best evidence is furnished by the nature of the inflicted wound. If the wound was made after death the superficial layers are only partially filled with blood; if, on the contrary, the wound was made during life the blood is disseminated through the capillary vessels, several mm. into the injured tissue so that it is not only reddened superficially, but also somewhat deeper seated.

Abattoir inspection. European authorities believe that the flesh of animals which die a natural death is not always unwholesome, as is generally believed, but judge it according to the disease from which the animal dies. The carcass of an

animal that dies a natural death decomposes very quickly, often within twenty-four hours or sooner, which makes it unwholesome and should therefore be condemned in every case regardless of the disease.

3. IMMATURE ANIMALS.

This is only of importance in regard to calves, in consequence of their extensive use as food, in which case the animal is slaughtered soon after birth before the navel is healed.

Symptoms: The flesh is soft and flabby and easily pierced with the finger, is very moist and has a characteristc gloss; the fat is not developed, instead we find, especially on the capsule of the kidney, a yellowish or grayish red, tough, somewhat jelly-like mass. The muscles are very poorly developed.

Abattoir inspection. Immature flesh does not possess the characteristic qualities of veal and should not be sold as such, but stamped accordingly. Exclusion from commerce is not justified, according to the German authorities, because the flesh is neither unwholesome nor in any way harmful to consumers. In certain localities people prefer the flesh of immature calves, and doctors frequently prescribe it in the form of bouillon for convalescents. For this reason rules forbidding the slaughter of calves in which the navel has not healed, or which have not attained a fixed weight (30, 35, 40 Kilo) or age (8, 10, 14, 20 days) are not always justified. In localities where this kind of meat is in demand the slaughter of such animals should not be forbidden. (See rules of the Government Meat Inspection.)

4. UNBORN ANIMALS.

Unborn animals are not, as a rule, brought into commerce, as they are easily detected by the laity; the umbilical ring is open, the hoofs soft and the intestinal tract contains no food. In addition to this the muscles are soft and watery, the fat jelly-like, the bone-marrow always red, the blood vessels of

the navel extended and the lungs contain no air (Atelectasis) and sink in water.

Abattoir inspection. The flesh of unborn animals, like that of animals that died a natural death should be condemned.

5. ADVANCED AGE.

Old animals generally emaciate rapidly if not properly fed. They have a very bad form and on the so-called "points" there is very little fat, the muscles become darker and harder and the fat disappears. (See page 54.)

Abattoir inspection. The flesh of old, emaciated animals is allowed to be sold provided that emaciation was not caused by disease and the muscles not saturated with water. (See page 55.)

6. EMACIATION.

Emaciation may be caused by advanced age, bad teeth, which impair mastication, or by a general disease (for symptoms see page 55). In many cases emaciation is accompanied by a serous infiltration of the muscles. (See page 185.)

Abattoir inspection. The flesh of emaciated animals in which the cause was not local or general affection, may be used. If emaciation was caused by an acute or chronic disease (tuberculosis) or accompanied by serous infiltration of the muscles the carcass should be condemned. (See page 185.)

7. GESTATION.

Gestation has no hurtful influence on the flesh and it is therefore as a rule, allowed to pass even if in advanced stages of pregnancy. (This is not the case in this country. See rules of the Government Meat Inspection. A. T. P.)

8. COLORATION OF FAT.

In exclusive grass or corn feeding the fat of animals usually has a yellow color, which is confined only to the fat. (See Jaundice, page 187.)

Abattoir inspection. The flesh may be used for food.

9. ABNORMAL ODORS OF MEAT.

These are caused, first, by sexual activity, animals kept for breeding (boar, billy goat, sometimes ram and bull); or, second, by excessive feeding of herring or swill (swine).

Symptoms: The meat has a peculiar odor which after a time disappears, but in many cases can be noticed again in cooking. In boars it is called boar odor, and in billy goats and rams, a bucky odor. The fat is soft and gray or yellowish. Overfeeding from herring causes the meat to have a fishy odor, and swill a stale rancid odor.

Abattoir inspection. The meat is stamped and allowed to be sold. It is advisable to allow the carcass to hang twenty-four hours in order to allow the odor to disappear, and then to cook separate parts; if after this no odor is perceptible, it is allowed to pass. (In this country the meat is tanked. A. T. P.)

10. DISEASES NOT DISCUSSED.

There are still a number of diseases and pathological changes in animals which, under certain conditions, may have a detrimental effect on the meat. The symptoms are various and cannot be enumerated here.

They must be judged according to the discussions made in different paragraphs. If the inspector has the least doubt as to the decision, or cause of the trouble, he should consult his superiors or the Rules of the Government Department.

XVII. PATHOLOGICAL CHANGES WHICH FIRST MANIFEST THEMSELVES ON THE FLESH AFTER SLAUGHTER.

From the time of slaughter to that of consumption the meat may undergo many changes which can more or less influence its usefulness. Even during slaughter it may be contaminated by the contents of the intestinal tract, gall bladder, or with

pus or turbid matter. (See pages 156-188.) Warm flesh has an affinity for all odors (tobacco, carbolic acid and chloroform, etc.), in consequence of which the meat becomes useless for food. Besides this the presence of certain ingredients (lead) in cans or articles with which meat is preserved impart to it injurious properties. Eggs of flies and larva are frequently found in meat, especially in sausage. If the eggs and larva cannot be entirely removed, the meat is highly unfit for use. Most pathological changes in the meat are caused by the influence of vegetable pasasites, namely, the bacteria. It has not been demonstrated that moldy meat is injurious; it can be used after removal of the affected parts. The same is also true of the red discoloration on the surface of the meat. Meat which produces illumination in the dark, caused by bacteria, is excluded from public use as unfit for food.

I. PUTRID MEAT.

Meat is a good medium for the development of bacteria, and therefore it spoils very easily if it is not kept at a sufficiently low temperature (cooling rooms) as well as in well ventilated rooms. This is true not only of raw, but also boiled, roasted, or otherwise prepared meat (sausages). Putrefaction is hastened by keeping it in damp, warm, poorly ventilated rooms (sleeping rooms); newly killed or freshly cooked meat, sausages and entrails putrify much sooner than that which is solid and undissected. The flesh of healthy well bled animals keeps longer than that of sick, emergency slaughtered and poorly bled ones.

Symptoms: Putrified samples have a dirty gray, or greenish color, are soft and smeary and have a more or less disagreeable odor. Putrefaction commences on the surface and continues to go deeper. In some cases little or no sign of decay can be detected, in which case a chemical analysis must be made. (The determination of ammonia after Eber.)

Abattoir inspection. During putrefaction several chemicals are formed which may impart very injurious properties to the

meat, and in many cases have caused death. Putrid meat, no matter if from domesticated or wild animals, must always be looked upon as unwholesome and should be excluded from public use.

2. OVER-HEATED MEAT.

(Wild animals.)

By the term "over-heated" is meant the condition in which meat of domestic or wild animals is found if packed while warm. In this case the change can take place a few hours after death, even if the outer temperature is below zero.

Symptoms: The animal has an unpleasant, sour odor, an extended abdomen, the skin is greenish, the hair loose, the muscles soft, flabby and often contain gas, and the intestines have a blood red color. This condition differs from the stage of putrefaction, in as much as it occurs soon after death, and that upon chemical analysis ammonia is absent, but on the contrary we find sulphuric acid.

Abattoir inspection. Although it has not been proved to produce disease, yet it should be excluded from use because as a rule it contains gas bubbles, disagreeable odors and the like, so that it can hardly be considered fit for use.

3. BLOWN-UP MEAT.

Blowing-up of meat is practiced mostly on calves, sheep, seldom cattle, and also on the lungs for the purpose of imparting a better appearance to the meat or organs than they naturally possessed. It is done either with the mouth, or bellows in the following way: The air is blown down the trachea into the lungs. In cattle an incision is made on the skin in the region of the breast-bone, a steel is run in different directions under the skin while some person blows into the several parts and still another uses a club on the animal to keep it moving about so as to disseminate the air through the entire body. Only the fore-quarters are blown up. By this method sheep and young calves are blown up at the hind quarters and back surface of the hocks. Large calves are

blown up at the hocks and breast-bone (Sternum). In calves the steel is run into the leg on the inner side of the thigh, closely under the pelvis in the region of the groin and air blown into the incision. The fore quarters are seldom blown up, though sometimes it occurs on the hind part of the fore limb. Blowing-up of meat can be done to greater advantage while it is still in a fresh condition, although meat, especially calves are sometimes blown up shortly before they are delivered or sent to market. Where this practice is not forbidden blowers are used to a great extent, otherwise it is done by the mouth.

XVIII. EXAMINATION FOR TRICHINA.

The examination of meat for trichina should be performed by the regular meat inspector. The separation of this work from that of meat inspection, and its assignment to another person, as has been done in Europe in many places, is not only a great disadvantage in itself, but also makes the expense of the work greater, and so forms a hindrance to the introduction of general meat inspection. If the examination for trichina is here treated under a special heading, it is for the reason that such examination can only be performed by means of a special instrument (microscope), and presupposes an accurate knowledge of this instrument and of the finer (microscopical) structure of several parts of the body, especially the muscles.

(A) The Structure of the Muscles and Their Constituent Parts.

I. MUSCLE FIBRES.

As shown on page 15 the muscles are made up of separate muscle fibres, which lie beside each other and are unbranched. Each muscle fibre consists of the sarcolemma, which forms a transparent, delicate, tubular sheath, and the sarcous or con-

tractile substance which is enclosed by this sheath. The contractile substance shows under the microscope fine longitudinal and more prominent cross-striations. It looks as if the contractile substance were made up of very small cubes, which are packed upon and beside each other within the sarcolemma or muscle sheath. On the inner surface of the muscle sheath may be seen under strong magnification, especially if acetic acid is added, small, oval bodies, which are known as muscle-corpuscles or nuclei.

These muscles, which are made up of muscle fibres such as those just described, are called cross-striated or voluntary muscles, because their activity (contractility) is under the control of the animal's will. The cross-striated muscles are red, are fastened directly to the skeleton and form what is commonly known as meat.

Besides the cross-striated muscles there are smooth muscles, which are called involuntary muscles, because their activity is not under the animal's control. They are pale or rose red and are found in the muscular walls of the viscera (stomach, intestines, uterus, blood-vessels, etc.). They are made up of long spindal shaped cells, in each of which, especially after the addition of acetic acid, can be recognized an elongated nucleus. The smooth muscle fibres have no cross-striations, nor do they possess any muscle sheath.

Between the cross-striated and the smooth muscle fibre stands the heart muscle. This consists of cross-striated muscle fibres, which, however, have no muscle sheath, and are branched and connected with each other.

Trichinae that are capable of development are found only in those muscle fibres which possess a muscle sheath and are cross-striated. Hence they never occur in the heart and in smooth muscle fibres.

2. CONNECTIVE TISSUE.

This is found scattered throughout the entire body (see also page 12) and consists of strands which are made up of

separate connective tissue fibres. Connective tissue may either have a definite form and structure, or may be without any particular form of its own, but scattered amongst the other tissues.

That which has a definite form consists of firm, white, glossy fibres, which lie close together and form thick, strong cords called the tendons; or they form broad plates or sheets, which as narrow or broad bands and membranes bind the different parts together, cover organs and line cavities (serous membranes), form the principal parts of mucous membranes and the outer skin, enclose muscle masses, etc.

The second kind of connective tissue has an open, loose structure, and consists of fine, clear, somewhat wavy fibres, which are united into small bundles, and are interwoven among themselves so as to form a tangled net-like tissue, in which are found numerous small cavities (connective tissue cavities, lymph spaces). This loose connective tissue holds together the small muscle bundles, and indeed the separate muscle fibres of which they are composed, binds these into larger bundles and finally into complete muscles; it encloses nerves, blood-vessels, lymphatic vessels, etc., and forms in general the frame work for the separate organs of the body, as the liver, kidneys, etc.

In the loose connective tissue, especially after the addition of acetic acid, are found cylindrical fibres, which are branched and united to each other, and are frequently rolled up at the ends. These are known as elastic fibres, and a mass of these as elastic tissue.

3. FAT.

According to the condition of the animal (see also page 54) there is more or less fat stored up in the meshes of the loose connective tissue. It is found between and also in the muscle fibres in the form of small, round, clear vesicles (fat cells), which are bounded by a delicate, thin membrane and contain within them a drop of oil. The fat cells always occur in

smaller or larger masses which have a lobed structure somewhat like a bunch of grapes. In the fat cells are occasionally found stellate bunches of fine crystals (margarine crystals). In smoked meat the fat cells are mostly opaque and shrunken.

4. BLOOD AND LYMPH VESSELS.

These run throughout the entire body (see also pages 22 to 24), and appear under the microscope as fine, round, branched tubules. The walls of the blood-vessels contain connective tissue fibres and smooth muscle fibres. The walls of the capillaries are formed of flattened, irregular cells united to each other by their edges by cement substance.

5. NERVE FIBRES.

The nerves originate from the brain and spinal cord and run throughout the entire body the same as the blood-vessels. They consist of separate nerve fibres, which are bound together into bundles by connective tissue. The larger bundles or nerves proceeding from the brain or spinal cord divide into smaller bundles, and these again into smaller, thus ramifying throughout the entire body. The nerve fibres themselves do not divide. One nerve fibre at least is always connected with each muscle fibre. The central portion or essential portion or essential part of the nerve fibre, the axis cylinder, is surrounded by a white substance, the medullary sheath, and this again by a delicate membrane. Hence under the microscope the single nerve fibre shows a double outline, the outer being smooth and the inner appearing irregular and glistening.

(B) THE MICROSCOPE.

Trichinae are not visible to the naked eye. In order to see and recognize them, the piece of meat to be investigated must be magnified or enlarged. To enlarge and render visible objects which are not visible to the naked eye we have a special instrument called the microscope.

I. THE STRUCTURE OF THE MICROSCOPE.

The instrument used for the examination of trichina is a very complicated one and consists of two principal parts:

(a) The mechanical part, and

(b) The optical part.

(a) THE MECHANICAL PART.

This is called the stand, is made out of metal and serves to carry the optical part and hold it in a definite position.

To the mechanical part belongs:

1. The foot,
2. The pillar,
3. The tube carrier,
4. The outer tube,
5. The tube proper,
6. The coarse adjustment (absent on some microscopes),
7. The fine adjustment,
8. The stage,
9. The stage opening,
10. The diaphragm,
11. The mirror.

(b) THE OPTICAL PART.

By means of this the enlargement of the object to be investigated is accomplished. To the optical part belongs:

1. The objective,
2. The ocular.

The microscope is constructed out of the above mentioned parts in the following manner: From the horse-shoe shaped foot rises the pillar, which has an arm (the tube carrier) at its upper end. This carries the perpendicular outer tube in which the tube proper is placed. This can thus be easily slipped up or down, though in the better microscopes a coarse

adjustment is used for this purpose. For the more delicate adjustment of the tube the fine adjustment is used. The tube is blackened within, and the lower end is fitted with a screw thread into which the objective with its lenses can be screwed. The upper opening of the tube is for the ocular (a short tube with two lenses). Under the tube carrier and at about the middle of the pillar is located the stage, on which the object to be examined is placed. In the middle of the stage and directly under the tube is a round opening. In many microscopes we find under this opening, and fastened to the under side of the stage, a rotary disc (the diaphragm) in which are holes of various sizes, by means of which the amount of light passing through the opening can be regulated. Under the stage is placed a mirror, which can be turned in any direction, and which has one side flat and the other concave.

The principal points to be demanded in a microscope are good lenses, especially the lenses of the objectives, so that the object appears perfectly clear, a foot sufficiently broad and heavy to hold the microscope firm, and a stage sufficiently large to easily hold the preparation.

2. THE WORKING OF THE MICROSCOPE.

The enlargement of an object is brought about by the lenses of the objective and ocular. These are round, finely polished glass discs, one or both sides of which may be convex. Such glass discs or lenses have the power to produce an enlarged image of objects when the rays of light from these objects pass through the lenses.

If one wishes to obtain a clear view of an object which is to be magnified, it is necessary that the lens be placed at a definite distance from the object. The object must be somewhat nearer the lens than the point known as the burning point, or principal focus; that is, it must lie within the principal focus. The more convex the surfaces of the lens, the stronger it magnifies and the shorter the distance from the principal focus to the lens (the principal focal distance). A

number of slightly convex lenses have the same effect as one strongly convex lens.

The working of the microscope is as follows: If an object be placed on the stage exactly in the principal axis of the lenses, and the tube with the objective be lowered to such a point that the object lies close to the burning point, yet still outside the principal focus, there is formed on the other side of the objective, and so within the blackened tube, a real inverted image of the object. If this be now brought near the burning point of the ocular, but within the principal focus of the same, it will be still more magnified by the ocular. As a result, in looking through the ocular one does not see the image produced by the objective, but an enlargement of this image, though it is not inverted a second time; hence the image seen in the microscope always appears inverted. The amount of magnification depends not only on the lenses of the objective, but also on those of the ocular.

The working of the microscope is essentially aided by two attachments by means of which it was first made practically useful. These are the mirror and diaphragm. With common daylight or lamplight the magnified image appears dim. In order to make this brighter, the light is reflected by the plane mirror and thrown through the opening in the stage of the object, so that this becomes thoroughly illuminated, and as a result the image also appears bright. In order to increase the illumination, as is necessary for stronger magnifications, the concave mirror is used. This condenses the rays falling upon it (similar to a burning glass) at one point, and is thereby able to illuminate the object sufficiently for quite a high magnification. The rays coming from the concave mirror are condensed so much, however, that they illuminate the object unequally, and cause the image to be distorted and indistinct. To prevent this, the amount of light passing through the opening in the stage must be reduced by bringing under it one of the small openings in the diaphragm. In

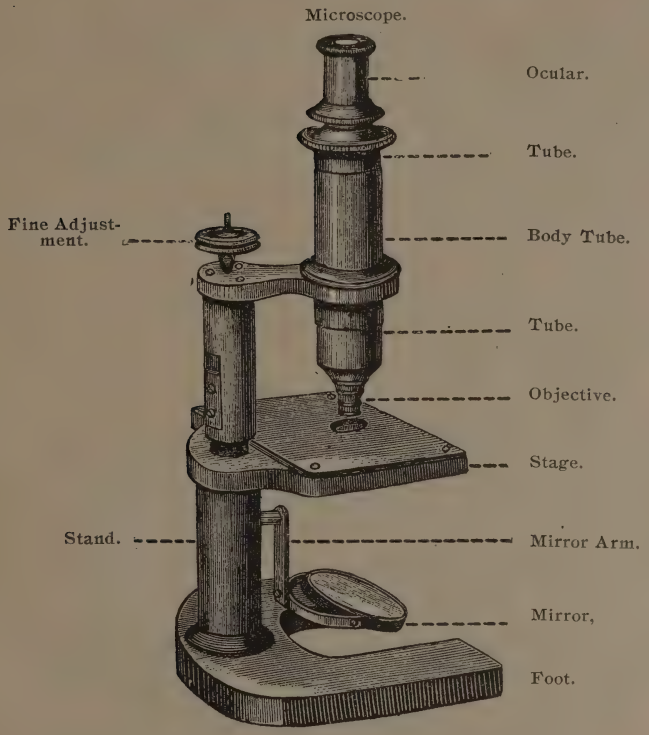


FIG. 24.

spite of the small opening the light is sufficiently strong for an equal and sharp illumination of the object.

For the working of the microscope the following things are necessary:

(a) For low magnification:

1. A low power objective,
2. A low power ocular,
3. The plane mirror,
4. A large diaphragm opening,
5. The tube not entirely shoved down. (The focal point is quite a distance from the objective.)

(b) For high magnification:

1. A high power objective (as a rule supplied with more lenses),

2. A low power ocular; the use of a high power ocular is, if possible, to be avoided, as it makes the image appear darker,

3. The concave mirror,

4. A small diaphragm opening,

5. The tube almost shoved down (the focal point lies near the objective),

6. Thin glass covers (thick covers may prevent the object being brought within the focal distance of the objective.

3. THE USE OF THE MICROSCOPE.

For the proper preservation of the microscope it is best to keep it in a tight fitting case made for that purpose, in which various accessories, as slides, scissors, etc., may also be placed. To save extra handling and wear, the ocular and objective are usually not removed from the tube. The cleaning of the microscope is one of the most important points. The metal parts should always be bright and shining, and must be carefully cleaned both before and after using. The optical parts of the microscope (ocular and objective) are on the contrary only cleaned when necessary, in order to preserve the lenses. Before using the microscope, however, one should always ascertain whether the lenses are thoroughly clean. Besides the usual method of examining the lenses, dirt on the objective may be detected by the fact that the field appears dark, or that there are spots in it which follow the tube when turned. It can also be very readily detected by removing the ocular and looking through the tube. Dirt on the lenses may be removed by a dry, soft camel hair brush, or the objective may be removed and cleaned with lens paper. Linen and blotting paper are to be avoided. In screwing the objectives into the tube care should be taken not to touch the lenses with the fingers, or the glass will be soiled. Fat is removed with a drop of ether or benzine.

The microscope should be placed upon a firm table of such a height that a person sitting can easily look into the tube, and 2 to 3 feet from a window, which, if possible, should face the north or northeast. The mirror should next be placed in proper position. To do this take hold of it with both hands and while looking through the tube move the mirror back and forth till the field in view appears clear and bright. The light which strikes the mirror should be as near horizontal as possible. The best source of light is a bright cloud; the blue sky, direct sunlight or dark clouds are to be avoided. If one is obliged to work by lamplight it is well to put in the opening of the stage a light-blue or light-gray glass.

The microscope is now ready for the preparation or object to be examined. In order not to injure the objective with the preparation, the tube should first be shoved down as far as possible, and then, while looking attentively through the microscope, slowly raised (with the coarse adjustment), until the image stands out clearly. It is to be remembered, however, that with low magnifications the tube must be raised higher than with high magnifications. When the image stands out clearly, one hand should be placed on the fine adjustment to regulate the focus more carefully, and the other used to move the preparation about the stage. While thus carefully moving the preparation back and forth in order to thoroughly examine it, the fine adjustment should be changed as often as the image appears at all definite or indistinct. These details must be carefully observed, but one soon becomes accustomed to them, and also to the fact that the object is seen inverted, and that hence the preparation must be moved in exactly the opposite direction from what would seem to be right. One should also become accustomed not to look through the microscope with one eye all the time, but to change eyes from time to time, and not to close the free eye, but to keep it open.

4. THE USUAL CONSTITUENT ELEMENTS AND IMPURITIES OF THE MOUNT.

The trichina investigator must first endeavor to become familiar with the isolated constituent elements and the most common impurities of his mount. With regard to the appearance of the muscle fibres and connective tissue fibres, or

Muscle Preparation showing Trichinae, Air, Fat Cells, Etc. (Long & Preusze).

FIG. 25.
(Magnified 30 Times).

fat globules, etc., (see pages 202 to 220). Those parasitic and pathological changes which are similar to trichina and therefore might be mistaken for the same, will be discussed later. (See page 229.)

At this place we will only discuss the accidental contaminations which are often seen and with which the examiner for trichina must be familiar.

They are:

(a) AIR BUBBLES. These appear mostly as round, seldom as irregular, formed structures, bright at the center and circumscribed by a dark broad border, becoming brighter toward the outside. They are of different sizes and are usually found scattered. Upon pressure of the cover glass they are removed and their form changed.

(b) FAT GLOBULES are spherical and circumscribed by a black, narrow zone. In the center they are light and strongly refractive, toward the edges darker. They occur mostly in groups of different sizes, and at times are seen in irregular forms, and by the addition of ether they are dissolved.

(c) CLOTH FIBRES are mostly long objects, which, according to their origin, have different appearances, or are usually colorless, or artificially colored.

FIBERS.

FIG. 26.
(a) Silk Fiber, (b) LinenFiber, (c) Cotton Fiber, (d) Wool Fiber. (Orth).

(1) Linen fibres are in transverse sections, circular, longitudinally striped, often knotty, or thickened, ring-like and mostly fine fibre closely at the border (see figure 26).

(2) Cotton fibres in transverse sections are flat, ribbon-like, with rounded borders and somewhat spirally twisted. (See figure 26c.)

(3) Silk fibres are round, smooth, glossy, non-striped and sometimes show wing-like appendages (Figure 26a).

Hair and wool fibres in a transverse section are round, at the center light and darker at the borders. Superficially they show linear or scale-like markings (Figure 26d).

Other contaminations are dust, sand, particles of coal, crystals, etc. They show different forms, but mostly sharp angles and corners.

(C) THE TRICHINA.

The trichina in the human cadaver was first discovered and described in the year 1835 by Professor Dr. Owen of London. Dr. Owen placed it in the group of smooth round worms and gave it the name of trichina spiralis.* The life history of the trichina was, however, only later, and indeed not until 1860, through many numerous observations and experiments, carried on by numerous investigators, such as Geaboldt, Leuckart, Zenker and others, more minutely described.

I. THE DEVELOPMENT AND FORM OF TRICHINAE.

If an animal, for instance a pig, partakes of meat that is infected with muscle trichina, the capsule that surrounds the trichina is dissolved by the gastric juice and the trichina is set free. They grow and within 30 or 40 hours are mature. (An intestinal trichina.) Coition takes place and in six to seven days after partaking of the infected meat they have borne young. The young trichinae (embryos) now pass through the walls of the intestines with the blood stream into the muscles, where they begin to wander. The wandering lasts about 2 or 3 weeks. On arriving in the muscle fibre the young trichina lies dormant for about two weeks, grows and transfers itself into Muscle trichina, in which it usually assumes the form of a spiral (see Figure 8.) The muscle fibre is destroyed and a capsule is formed around the trichina. The growing of the capsule commences about the eight or ninth week after the taking of the trichina and is completed in about three months. In this condition the muscle trichina is

*The word "Trichina" comes from the Greek word "Thrix" meaning "hair," because the worm is hair-like; "spiralis" is used because the trichina is found coiled-up like a spiral thread.

completed and if taken up by other animals it is again developed into an intestinal trichina. The encysted trichina remains dormant, yet in about six months the capsule begins to calcify and in 1¼ to 1½ years the capsule is fully calcified. This calcification may also extend to the trichina itself. One has, therefore, two different stages of development to distinguish.

Adult Intestinal Trichinae. (Leuckart).

a (a) Female, (b) Male.
FIG. 27.

1st. THE MATURE, full-grown "Intestinal trichinae," male and female, which breed in the intestines of the host and produce living young.

2nd. THE "MUSCLE TRICHINA," which encysts itself in the muscles of the host and is recognized as the larval condition of the intestinal trichina.

1. THE INTESTINAL TRICHINAE are small worms, pointed in front, truncated behind. One of the peculiarities of the trichina to be mentioned is the so-called cellular structure, which begins anteriorly and extends backward over one-half the length of the body. The "cellular structure" is formed from a single cell. The intestinal trichina develops from the muscle trichina within thirty or forty hours after entrance into the stomach, where the gastric juices dissolve the capsule. More females are developed than males. Before the second day they mate. The expulsion of the young begins at the sixth or seventh day. One female breeds 1,500 young and dies in six or eight weeks. The male dies much sooner. The developed

male is at the most 1½ mm long and possess at the anus two hooks, and which, when it pregnates the female, clamp like a pair of tongs. The developed female is from 3 to 4 mm long. In the ovaries the eggs are formed from which after fertilization the young trichinae develop in the abdomen (embryo, see Figure 28). The young trichinae are, at birth, about 0.01 mm long, but they grow very rapidly, and when they wander into the muscles they are 0.12 to 0.16 mm long. Until recently it was believed that the young trichinae bored through the walls of the intestines, got into the abdominal cavity and from there by independent movement, succeeded in reaching the muscles and in this way they would wander until they had found the muscle fibres and there remain.

In later years we are of the opinion that the females place the young not in the intestines, but into the walls of the intestines, and often direct into the lymphatic glands. From here the young reach, by aid of the lymphatic circulation, the arterial circulation, and with the blood arrive at the muscles, where they bore through the capillaries and begin to wander. The most of the wandering trichinae are found between the ninth and twelfth day after infection with trichina.

2. The Muscle Trichinae. The muscle trichinae are found in all cross-striatic muscles, with the exception of the heart muscle. They do not penetrate, however, all muscles uniformly, but favor the thinner and finer muscles, which they, for the most part, locate as near as possible to the point of attachment. As the most favorite resorts of the trichina are the muscles of the diaphragm, of the tongue, of the larynx, of the abdomen, and the intercostal muscles, also the muscles of the eye, the flanks and the buccal muscles, numerous investigations and calculations have determined that in a very slight infection of muscles by trichina the following muscles are regularly affected:

(a) The pillars of the diaphragm (the kidney band);
(b) The diaphragm (the crown);
(c) The muscles of the tongue;

(D) The muscles of the larynx.

These muscles are therefore the best suited for the investigation for trichina. If the young trichina has reached the muscle fibre, then it stays there about sixteen days in order to grow and to transform itself into the muscle trichina. Its length then amounts to one mm. After growth ceases the trichina rolls itself into the form of a spiral or shape of the figure 8, the mouth end turned inward. As a result of the in-wandering of the trichina the muscle fibre loses its cross-striation, becomes cloudy, granular, turbid, and terminates in inflammation of the muscles. The muscle fibre becomes thick, spiral-like and new capillaries are formed and the muscle sheaths are filled with round, cell-like substances. Finally the cells form around the spiral trichina and thicken to a capsule. The destroyed contents of the muscle fibre disappear and the muscle sheath unites with the capsule and fuses at the ends. The forming of the capsule begins eight or nine weeks after the invasion of the trichina and is finished in about twelve or thirteen weeks. The so-formed capsule is lemon or spindle-shaped has a two-fold, sharp boundary, and is distinctly set off from its surroundings, parallel to the long diameter of the muscle fibre, is somewhat darker at the ends and in the center the trichina is plainly visible.

In animals that are in good condition we find at the ends fat cells. The length of the capsule is usually about ⅓ and the width ¼ mm, so that by a magnification of twenty or thirty diameters they appear about seven to ten mm long and five to seven mm broad. As a rule we only find one trichina in a capsule. In badly infected flesh we may find more than one and sometimes six.

About six months after the invasion of trichina the capsule begins to calcify, this taking place first at the ends. In fifteen or eighteen months the whole capsule may be calcified. The capsules are then quite opaque and the trichinae contained within are not easily recognized unless we dissolve the lime with acids. With the forming of the capsule the muscle

trichina is fully developed. It is very similar to the intestinal trichina, only smaller, and not ready to be fertilized. If meat that contains such dissolved lime is devoured by animals, then these capsules are dissolved by the gastric juice and the muscle trichina develops the intestinal trichina. The muscle trichinae maintain their vitality very long, even for years in their hosts. The calcifying of the capsule does not hinder them, but it can also extend to the trichina itself and the calcification may be so complete that we can see but few remains of the trichina, or no traces at all when the lime has been dissolved with acid. We can only determine from the form and size of the dark spot found in the muscle fibre that there were trichinae.

Young Migrated Trichinae in the Muscle Fibers. (Leuckart).

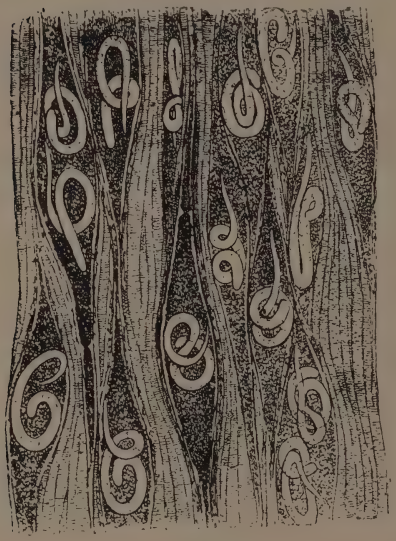


FIG. 28.

2. THE PRESENCE OF TRICHINAE.

Trichinae are found in most mammals. In some, for instance, sheep and calves, the muscle trichina is not developed, only the intestinal trichina. In all other animals, as in birds, the trichinae do not develop. The infection of trichinae in man is effected by the consumption of pork which contains muscle trichinae. Occasionally partaking of meat containing the trichinae, from wild boars, dogs, cats, foxes, bears, and the like may produce trichinae in man. Rats, of which 10% to 20% are affected with trichinae, form the chief source of infection for the hogs. The frequent occurrence of trichinae in rats, to-

gether with their wide distribution, and the eagerness with which the hogs catch them explain the fact that, especially old hogs (brood sows) are affected with trichinae, because they have had, during their long life, more chance to catch rats and eat them. In the examination for trichinae in hogs in Prussia one hog out of every 2,000 is affected with trichinae. In the East provinces the infection of trichinae in hogs is higher (one in every 200) than in the West (one out of every 5,000 to 20,000). (For the examination in pork for American meat see the meat inspection rules of the Bureau of Animal Industry.)

Muscle Trichinae just before Encystment. (Leuckart).

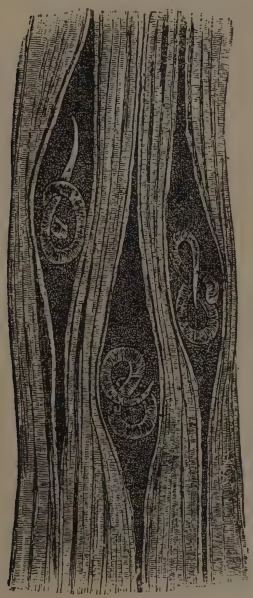


FIG. 29.

Symptoms: The health of the pig is not impaired as a rule under the influence of trichinae. Only in exceptional cases has colic or flux been observed through irritation of the intestines by the trichinae. The transformation undergone by the young trichinae in the muscle is only very seldom recognized by stiffness, lameness, pain and the like.

Upon post-mortem examination the meat affected with trichinae does not look different from non-infected meat and the presence of trichinae can only be ascertained by a microscopical examination. When a fresh invasion into the muscle fibre has taken place, or the calcification in the connective tissue is very strong, then it can be detected in the muscles when small pieces are placed between two pieces of glass and pressed and held to the light. These may be seen at times with the naked eye. These observations might, however, be made in other pathological conditions of the muscle, so that these small points represent

nothing peculiar to the trichinae. On the other hand the symptoms of trichinae in man are very prominent. In the first eight days after infection with trichinae there is a loss of appetite, biliousness, vomiting, diarrhoea, stomach ache. The symptoms are sometimes very pronounced, so that death may be said to be caused by typhoid or cholera-like attacks. In about ten days there are symptoms of general inflammation of the muscles; fever, pain and swellings of the muscles, hoarseness, difficulty of chewing, swallowing and breathing; puffy swelling of eyelids, the whole face and the limbs. These symptoms increase until the wandering of the trichinae has ended, i. e., into the fourth week. With the advance of the trichinae to encysting comes the convalescence of the patient, if death has not intervened.

Encysted Trichinae. (Leuckart).

FIG. 30.

Abattoir inspection. When a man partakes of pork that is infected with trichinae he may contract the trichina (trichinosis) disease which in a great many instances may cause death. Meat that is affected with trichinae is therefore dangerous, and should not be allowed to be sold. Even meat that is lightly affected with

trichinae is capable of producing trichinae in man. Muscle trichinae are only, then, dangerous when they can transform themselves into intestinal trichinae. Wandering, or totally calcified trichinae are, therefore, not dangerous, because they cannot develop into intestinal trichinae. It must be remarked that besides calcified trichinae and those incapable of development, there may be present in some specimen uncalcified trichinae and those capable of development. By drying, pickling

Adult Muscle Trichinae removed from the Cyst. (Leuckart).

FIG. 31.

and smoking the trichinae are killed; though this process is not always certain, and it has been observed, particularly after the use of smoked sausages and raw ham, that man has been affected with trichinosis. Cold does not have any influence on trichinae, but heat has a decided influence in destroying them. The custom of using raw or half raw pork is therefore to be condemned. The human being would not be subject to the disease if they would use pork in its cooked condition. For this reason meat that contains trichinae could be used after it has been thoroughly cooked (so that the inside of the meat looks thoroughly

white), or after it was placed in a steam sterilizer and thoroughly steamed. After this has been done it can be used without any ill effects and is allowed to be sold in Saxony and in other countries. (For the inspection of trichina in the United States see rulings of the Bureau of Animal Industry.) In Prussia meat that is affected with trichina is condemned. Only the carcass is to be used for fertilizer, lime, soap, and for chemical purposes; even the intestines are condemned and destroyed.

ENCYSTED MUSCLE TRICHINA (LONG AND PREUSSE.)

FIG. 32.

(D) THE EXAMINATION FOR TRICHINA.

I. THE TAKING OF SAMPLES.

For the examination you take with a sharp knife (see figure 37) a sample about the size of a hazelnut, of a certain muscle, of the longitudinal section of the muscle fibre, mostly at the transition of the muscles into the tendons. For this it is best to take them as page 216 shows.

(a) The pillar of the diaphragm or the kidney band (see figure 7); (b) the muscles of the tongue (see figure 4); (c) the muscles of the larynx (see figure 4); (d) the muscles of the diaphragm.

The taking of the samples must be done by the inspector personally. The taking of samples by other persons is not reliable, and in many of the laws prohibited, because on the one hand the right choice of the sample taken is of great importance and not very easily done; on the other hand, with the extraction of the sample must be noticed the presence of contagious diseases and other infections, swine plague, tuberculosis, taenia and the like.

COMPLETELY ENCYSTED MUSCLE TRICHINA (LONG AND PREUSSE.)

FIG. 33.

The hog, before the taking of samples, can only be cut into two parts, which, however, up to the snout must remain in their natural relationship to each other. A further dissection must not be allowed until the animal has been tagged. The samples taken must be immediately taken to the inspector's office and microscopically investigated. If many hogs are to be examined, then the investigator must take care at all costs, that the hogs in no instance be mixed. He must always know exactly from which animal each sample came. For the purpose we have a small box made out of tin, and which contains a running stamp with a running number with which the skin of the pig is stamped. The stamp is placed on a board (see figure 37) and for the taking of the sample we have a large box, which contains the small sample boxes (figure 38). In taking the sample the pig is numbered and also the box which contains the sample. In large packing houses, where a great many animals are killed there are certain men who take these samples, who do nothing else, and who are called samplers,

DEAD DECALCIFIED TRICHINAE (LEUCKART.)

FIG. 34.

DEAD DECALCIFIED AND DEGENERATED TRICHINAE (LEUCKART)

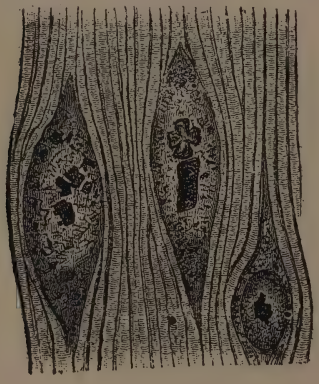


FIG. 35.

for it is very apparent that no mistakes must be made. The examiner for trichina receives a number of samples the boxes of which are numbered, who examines these for trichina and makes a separate report. The method of controlling the inspectors is different in different slaughter-houses. To go into detail would take a great deal of space. We would refer the reader to the rulings of the Bureau of Animal Industry.

In the examination of different particles of meat (ham and parts of the abdomen) it is of the very first importance to take the samples from the (4) muscles before mentioned. If there are no more to be had, or only in part present, then are the so-called favorite seat for trichina (see page 216) to be considered and the samples should be taken near the bones and tendon attachments. The number of samples and preparations should be the same as in the examination of the whole hog, especially for this reason, because one, in such cases, is seldom in a position to secure

the favorite seats of the trichina, and for this reason must make a more thorough examination. In sausages you cut from each kilogram about four slices at corresponding distances from each other, taking out of each slice with a needle such small particle for microscopical examination, which judging from its light color and fine fibrous appearance consists of hog meat.

2. PREPARING OF THE SAMPLE.

(For microscopical examination small particles are placed on the glass plate (slides) and covered with a second small glass plate (cover glass) and then ready to be examined. In the examination for trichina it becomes a question of placing all the pieces of muscles from a hog on one glass plate so

KNIFE USED IN TAKING SAMPLES.

FIG. 36.

that they be not misplaced and that they be transparent as possible. In order to satisfy the demands special glass plates are made called compressors. (See figure 39.) The most practical compressors consist of two thick glass plates about 12 to 15 cm long and 3-5 cm broad, fitting accurately upon another and forced close together by two screws at the ends. The lower plate is covered by twelve lines and the upper plate is crossed by a dulled field at right angles to the lines of the lower plates. The matted surface reaches from screw to screw and is numbered consecutively up to 24, thus dividing the compressor into 24 equal fields. The compressors are only serviceable for a slight magnification. For higher powers in which the focal distance is nearer, the glass plates are too thick and thinner slides and covers must be used. For the usual examination for trichina the compres-

sors are the best, and are therefore always used. The preparation of the mount is as follows:

When the compressors are taken apart and the plates thoroughly cleansed the particles of meat are first placed on the index finger of the left hand and held firmly there by the thumb and middle finger. After each specimen is cut up into six pieces in the longitudinal direction of the fibres with a pair of broad flat scissors, not curved (snipping shears), the samples to be free as possible of fat and tendons, they are placed in sequence on the field of the plate and parallel to each other with the pointed end reaching to almost the edge of the plate. The pieces are about the size of oat grains. Then the other glass plate is laid on top and by alternate screwing of both screws the samples are very strongly pressed until they seem transparent. The mount so prepared is now laid on the stage of the microscope and examined. Any addition whatever of fluids to the fresh soft specimens of meat is not necessary. In other cases these specimens must be treated more carefully to be made transparent. If the meat is dry or smoked we must add to the specimen, according to the dryness, a few drops of a salt solution (¾%) or acetic acid 3%, or a potassium solution (30%) with three parts of water. In very dry cases the specimens are previously immersed for one-fourth of an hour in this potassium solution (30%). If the dried meat is very easily disintegrated, then the fibres can be torn apart with forceps instead of scissors, laid on the glass plates and teased out further with needles, after having previously been laid in the potassium solution or glycerine (equal parts

WOODEN DISK USED IN STAMPING THE CONSECUTIVE NUMBERS UPON SWINE.

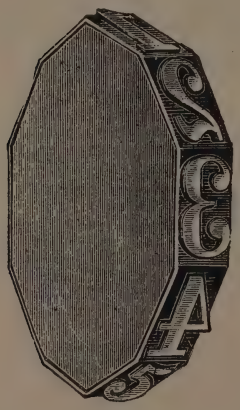


FIG. 37.

of water and glycerine). The preparation must in any case be transparent, after the teasing and compressing. The reagents must therefore be used until this condition has been reached.

3. EXAMINATION OF THE PREPARATION.

When the compressors are placed on the stage of the microscope (see page 207) then you proceed with the examination of the specimens. It is important that not one of the specimens is overlooked. For this purpose you begin on the left

TIN CASE USED IN TAKING SAMPLES OF MEAT. THE SAMPLE FROM EACH HOG IS PLACED IN A SEPARATE BOX.

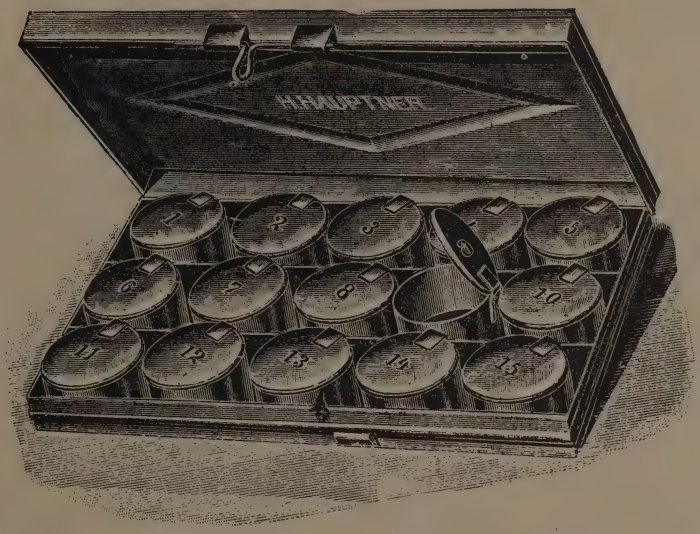


FIG. 38.

upper border of the first specimen and move the compressors, while you are carefully observing all of the fields in view, slowly along to the other side until you have reached the right upper border of the compressor, then move the compressor away from you about half a field view and move it again

laterally until the left edge is reached, and continue this until the lower edge of the compressor is reached. Then the other specimens are examined as above described.

In using the compressor one can use both hands in moving it, because the specimens are lying in a plane so that only in exceptional cases you are forced to use fine adjustment. In using two simple glass slides you hold the same with the left

COMPRESSOR.

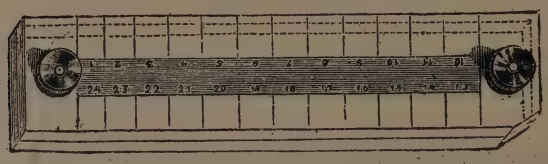


FIG. 39.

hand and with the right hand constantly use the fine adjustment in order to secure a clear field. In order to insure complete invesitgation of the samples, there are other apparatusses, some in part patented, but most of them are very complicated and for the ordinary investigating not advantageous. The most desirable magnification for examination of trichina is from ten to thirty. This, suffices, as a rule, to detect the trichina capsule. By higher magnifying power, portions of the specimens visible at one time are smaller and therefore the assurance of complete investigation is lessened.

The time for the preparing and examination of a specimen (exclusive of the time for securing the sample) is estimated to be about 20 to 25 minutes. In public abattoirs where the conditions for examinations are more favorable it can be done in about 18 minutes (as in Berlin), but never less than this. This is the least necessary time in order to make sure that nothing is overlooked.

The number of hogs that one examiner should examine in a day under no conditions should exceed twenty. Ordinarily on the continent where the trichina investigator must secure

his own specimens and must work under rather unfavorable conditions, 10 hogs are prescribed as the highest permissable number to be examined. In some places of investigations in which for the investigation of single pieces of meat (hams, etc.) a smaller number of samples are required, a larger number of pieces can be investigated in a day (30 hams and 50 sausages). If the examiner finds in one of the samples an object which corresponds in size and form to the trichina capsule, then he must, with the fine adjustment, thoroughly examine the same and ascertain if he cannot detect the trichina itself in the center of the capsule. If the object is dark then he must add to the specimen acetic acid and if it then does not become transparent he must add to it H. Cl. in order to make the trichina, or parts of it contained somewhere in it visible by the solution of the calcium. If he cannot by this method come to any definite conclusion then he must take the sample out of the compressor and place it on a thin slide, cover it with a cover glass, and examine it under high power. If this does not have the desired effect then he must examine new samples until he is thoroughly satisfied that the meat is free from trichina, or that it contains the same. If he cannot do this and still finds himself in doubt, he should leave the decision to competent, scientifically educated experts. If the investigators come to a definite understanding he must stamp the meat or finally seize it.

E. PARASITES WHICH CAN BE MISTAKEN FOR TRICHINA.

In the muscles of swine we do not find other round worms which resemble trichina; only in the microscopical examination of other animals (rats, mice, etc.) do we find different round worms which upon first glance resemble trichina. They, however, almost never lodge in, but between the muscle fibre and there is a lack of the peculiar trichina "cell structure."

On the other hand in swine, other difficult parasites and pathological transformations occur which resemble the trichina capsule and therefore might be mistaken for the same. Very rarely we meet in flesh or samples accidentally other living animals which, in a superficial observation, may lead to mistakes.

I. PSOROSPERMS.

These belong to the very lowest of animals (psorosperms) and form (under microscope) a bow or kidney shape and lying in untold numbers, together they form an elongated, often bent or knotty structure of various sizes and covered by a fine membrane. They are also called Miescher's tubes or Rainey's bodies. They lie in the muscular tissue, which, as a rule, does not undergo any pathological changes and does not lose its cross-striation. The psorosperms are found in the muscles of swine and sheep, very seldom in other slaughtered animals. In swine their favorite seat are the muscles of the abdomen and diaphragm; in sheep, the skin and the muscles of the abdomen.

MUSCLE PREPARATION WITH MIESCHER'S TUBES. (LEUCKART.)

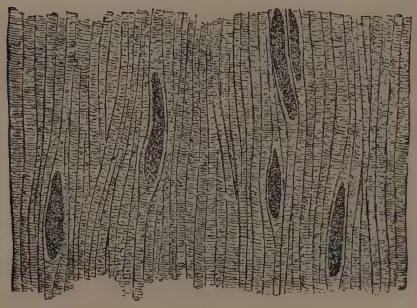


FIG. 40.

Symptoms: In swine the Miescher's tubes are so small that they cannot be seen with the naked eye. Only when they are partly or wholly calcified can they be detected as small, long grayish-white points. In sheep they are considerably larger and are therefore more frequently detected with the naked eye.

Detection. The Miescher's tubes are in most cases accidentally found upon microscopical examination. They differ from trichina in form and also by the fact that the muscle fibres in trichina are crowded together while they, in the Miescher's tubes, maintain their stratified condition. In the Miescher's tubes the contents is regularly distributed and calcifying begins in the center; in the trichina the contents is irregular (in the middle of trichina the ends are darker) and the calcification begins at the end. In complete calcification the Miescher's tubes are as such recognized, whereas, the trichinae, after the dissolving of the lime, are very easily detached. (See page 233.)

Abattoir inspection. A transmission of the Miescher's tubes to the human body has not been recorded, therefore the meat that contains the Miescher's tubes is not to be looked upon as unwholesome. If only a few of these tubes are seen

MIESCHER'S TUBES IN MUSCLE FIBER (LEUCKART.)

FIG. 41.

(about 5 to 10 on one field of view by a 30 magnifying power) and if the meat has not undergone any pathological changes it is allowed to be sold. If in the otherwise unchanged meat the infection of the meat with the Miescher's tubes is strong (about half) or the Miescher's tubes are calcified, then the meat is forbidden to be sold, only as tainted. If on the other hand the meat shows a watery consistency on account of the quantity of tubes, or is yellow or green variegated, or entirely gray, then it is to be excluded from sale as highly tainted. The advice of a veterinary surgeon is then only necessary when the investigator is in doubt as to the nature of the changes.

2. MUSCLE ACTINOMYCES.

In the muscles of swine (seldom in sheep and calves) one finds at times a sharp, circumscribed, dark, in the center lighter body with a scalloped border, which upon a high magnifying power (150, see page 148) shows a structure similar to the radiating fungus, but shows no club-shaped ends. The muscle fibres are at these points swollen up and colored a dark brown. At the affected parts the stratified condition is lost and by a stronger infection we find that the muscle fibres disintegrate. Later lime is deposited on

ACTINOMYCES IN THE MUSCLE OF SWINE (OSTERTAG).

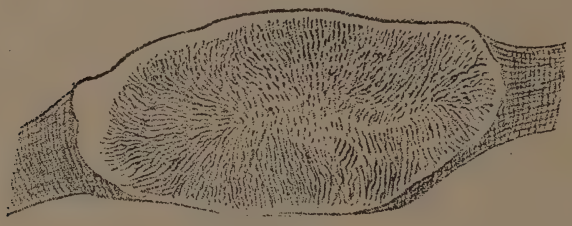


FIG. 42.
Magnified 240 times.

this radiating fungus. The favorite seats of the muscle fungus are the pillars of the diaphragm, and the abdominal and intercostal muscles.

Detection. The detection of the muscle radiating fungus is especially easy by a high magnification. In some cases the calcification is dissolved by acid. They differ from the trichina, aside from their radiate structure, in their more rounded structure and size.

Abattoir inspection. The meat which contains the muscle fungus is not unwholesome. The inspection concerns itself with whether the meat itself has suffered changes, and is covered at the time of inspection with psorosperms.

3. SOME DEPOSITIONS IN THE MUSCLES.

These occur in swine, seldom in sheep, and are either so

small that they can only be accidentally seen by the microscopical examination; or they attain such a size that they are seen with the naked eye. They are seen either isolated or in such numbers that the meat has a gray appearance from a distance, and upon closer examination appears as if pebbles had been kneaded into it. The calcification is seen in all muscles, though it is found more often in the muscles of the diaphragm, the abdomen, the skin, and the inner side of the ham. In sheep they always originate from calcified Miescher's tubes and must therefore be judged accordingly. (See page 231). In swine we find different parasites which give rise to calcium depositions, as the muscle fungus (see page 232), the trichina (page 221), the taenia (page 168), the echinococcus (page 175), or the psorosperms (page 230).

CRYSTALLINE DEPOSITS IN THE MUSCLES (HELLER.)

FIG. 43. Natural size.

Detection. In the examination the object to be determined is the parasite itself. For this reason we must dissolve the lime in a weak solution of acid and we are then in a position to detect the different parasites. In many cases this is not accomplished even by the most painstaking examination.

For the differentiation of the calcified parasites Professor Ostertag's book on Meat Inspection, second edition, 1895, gives the following methods:

(a) The muscle fungus is seated in the muscle fibre and is arranged like beads, possesses no capsule, and is seen, contrary to trichina, in the muscles of the heart.

(b) Miescher's tubes are also found in the muscle fibre which do not lose their striated condition, are of different sizes, are surrounded by a delicate membrane which is dissolved by the addition of potassium solution, and calcification takes place from the center.

(c) The trichina may calcify and die before the formation of the capsule, or the calcification begins at the ends of the fully formed capsule and proceeds from here. In the first case we find upon the addition of acids, no trace of the trichina, only the fact that the objects are not over 1 cm long and spindal formed and that they are lodged in the completely disorganized muscle fibres point to their being trichina; only the facts that the objects are not over 1 cm long the capsule then upon the addition of acids we can restore the capsule as to form, size and position and easily recognize its appearance.

(d) Taenia. Taenia are always larger and lie between the muscle fibres, have an outer connective tissue and we can, in the case of old taenia, detect the hooks and calcium grains.

(e) Echinococcus. These are very seldom seen in the muscles, and only then when the internal organs are badly infected with them. They lie also between the muscle fibres and are of different sizes. They differ from the taenia in that the so-called echinococcus skin shows a lamellating structure.

CRYSTALLINE DEPOSITS IN SMOKED HAM. (LEUCKART.)

FIG. 44.

(f) The deposits of crystals which are seen in smoked hog meat (hams) are not caused by parasites, but by a chemical deposition. They are seen as white dots with the naked eye. Under the microscope they are seen as irregular masses which extend to one or more muscle fibres. From the calcification

caused by the parasites they differ in this that they will be dissolved by acids as well as by potassium solution.

Abattoir inspection. This is concerned with the parasites causing the calcification. It is to be remembered, however, in connection with this, that all parasites need not be always calcified, but that flesh may contain with the calcified parasites other parasites capable of development. If the stock inspector cannot determine definitely the parasites causing the calcification then he must bring to bear the aid of a veterinary surgeon.

4. DISTOMA OF THE MUSCLES.

In microscopical examinations of pork there are found, however very seldom, delicate, fine, gray colored bodies about the size of the trichina capsule, lodged between the muscle fibres and upon being warmed show lively movements. Upon closer examination we can also detect the inner structure.

DISTOMA OF THE MUSCLE (LEUCKART.)

FIG. 45.

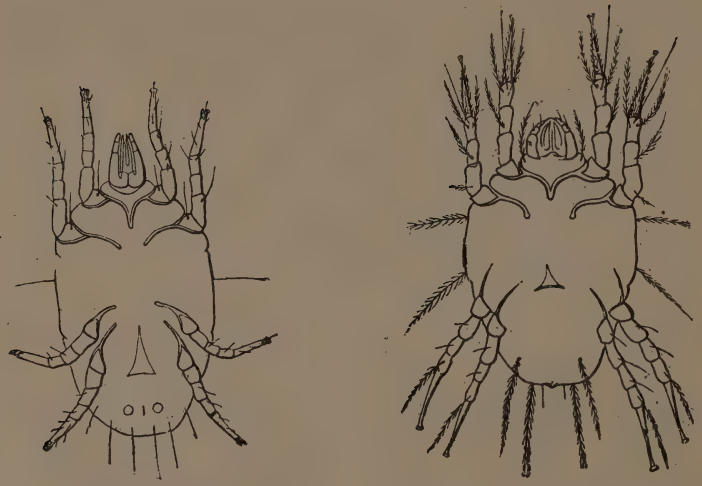
Abattoir inspection. These parasites occur only very seldom and are of little importance.

5. LIVING OBJECTS ACCIDENTALLY OCCURRING IN SAMPLES.

(a) The vinegar eel. These occur in old vinegar, and if vinegar is used as a reagent instead of acetic acid, may be mixed with the specimen. It is a fine thread-like worm which is very pointed at both ends, especially at the posterior, and shows very lively movements. It differs from trichina in not having the peculiar body.

(b) Lung worms. In examining hog lungs for thread worms often pregnant female worms are cut into. The young worms can adhere to the knife and get from this into the sample, as well as the mount, where they, upon first glance, give the impression of free trichina (see Lung worms). These particular conditions, the pointed ends, and the lack of the

MITES (Siedamgrotzky & Hofmeister.)



1. Cheese Mite. 2. Sarcoptic Mite.

FIG. 46.

cellular structure, in accurate investigations, protect however, against confusion.

(c) Mites. On old dried, smoked hams, especially in cheese mongers, mites at times settle, which in microscopical investigations upon first impression resemble trichina capsules. Upon closer examination you can detect the individual parts of the bodies, especially the head and the extremities (see figure 46). The confounding with trichina is therefore upon closer examination prevented.

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Ate Trichinosed Meat.

ST. PETER, Minn., Jan. 2.—An entire family, named Forbecock, living in the town of New Sweden, Nicollet county, is said to be stricken with trichinosis. Two of them, the father and a daughter, are already dead, and the physicians are said to have abandoned all hope of saving the surviving members. The disease is said to have been contracted through the eating of smoked sausage which had not been cooked.

A Victim of Blood Poison.

[Special to The Indianapolis News.]

WABASH, Ind., January 9.—James Keith, of Pawpaw township, this county, cut his hand while assisting in butchering some time ago. The wound partially healed, and Keith thought it of no consequence. Recently it began to inflame, and the entire arm is now swollen and in such a condition that the doctors have decided that amputation is imperative.

* * *

Who says the horse is going out of fashion? According to the returns of the French Minister of Agriculture, Paris alone, last year, ate 23,958 horses, 215 donkeys and thirty-four mules. That was over 590 more tons of horse meat than during the previous year.

[Special to The Indianapolis News.]

FRANKFORT, Ind., February 1.—A two-year-old son of Mr. and Mrs. Perry Wrightsman, of Sedalia, was taken violently ill yesterday, shortly after noon, and the physicians have been unable to determine whether the child had been poisoned or taken with an acute attack of congestion of the stomach. The two physicians in attendance are inclined to the poison theory, however. Mrs. Wrightsman had opened a can of peaches and given the child some of the fruit to eat, and a few minutes later the attack came, and the little one was seized with convulsions.

Fremont, Ohio, March 13.—The family of Andrew Lehman, residing in Scott Township, are suffering from blood poisoning, the result of eating diseased pork. The eldest son, John, is dead.

WATERBURY, Conn., March 14.—Cheese for supper and an attack of ptomaine poisoning in consequence nearly caused the death of three members of the family of William McCoy last night.

Two hours after the supper, Clarence, six years old, was attacked, and Martha, aged thirteen, was sent for the family doctor, but on the way was also stricken and had to be carried home. Henry McCoy, twenty-five years old, had a narrow escape from death, and a physician worked over him all night to save his life.

SPARERIBS WERE FATAL

ONE DEAD AND WHOLE FAMILY POISONED BY PORK.

PITTSBURG, Pa., Feb. 3.—As a result of eating pork supposed to have been doctored with some sort of a preservative a whole family was poisoned last evening. Mrs. Anne Fox is dead and Mrs. Ellen Cuddy, a widowed daughter of Mrs. Fox; Ella McCartney, a granddaughter; Thomas Cuddy, a grandson; James T. Fox, a son, and Harry M. Fox, a son of James Fox, are seriously ill. The family, who live at 2 Lanark-st., West End, all ate of spareribs for supper last night and within a short time afterward all were writhing in agony. Prompt medical attention saved all except Mrs. Fox, who died during the night. The others, though in a critical condition, may recover.

SCHMIDT FAMILY POISONED.

Father and Son Dead and Mother Dying.

CENTRALIA, Ill., February 11.—H. W. Schmidt, superintendent of the Illinois Southern railroad, died at Sparta to-day. His son Harry died Saturday night, and Mrs. Schmidt is not expected to live. It is supposed the family was poisoned by eating corned beef.

Victims of Ptomaine Poisoning.

[Special to The Indianapolis News.]

WABASH, Ind., March 6.—The two children of Charles Dew, four and two years old, residing in Whitley county, had a narrow escape from death night before last. They ate cheese heartily, and were attacked a short time afterward with ptomaine poisoning, and for some time their condition was critical.

HOGS WITH SMALLPOX.

Discovery of Dr. Zink, of the Bureau of Animal Industry.

BUFFALO, N. Y., Nov. 28.—Dr. C. B. Zink, inspector in charge of the United States Bureau of Animal Industry at the East Buffalo stockyards, discovered to-day what he believes to be an outbreak of smallpox among a consignment of hogs. The animals were received from St. Louis last week and they passed the first inspection. After they had been slaughtered Dr. Zink, in making a microscopical examination of the viscera, discovered what he believes to be evidence of smallpox. The slaughter houses are in the Polish district, where the local health officers are at present engaged in fighting an outbreak of smallpox.

The government bureau officials are under instructions to work in conjunction with the local health authorities in suppressing the outbreak here, and this afternoon Dr. Zink brought specimens of the diseased tissue to the Bureau of Health and submitted them to Dr. Wende. After examination Dr. Wende unhesitatingly confirmed the diagnosis of Dr. Zink.

"If the disease develops in animals in the same way as it does in human beings, I should unhesitatingly call it smallpox," said Dr. Wende. "These tissues bear all the characteristic marks of the disease. They are evidently of a contagious nature. The pittings and destrain of tissues are apparent as well as the characteristic smallpox postules."

Soldiers Are Poisoned.

CHEYENNE, Wyo., Dec. 25.—Eighty members of company F, Eighteenth infantry, were poisoned while eating breakfast today, and for a time fully half of them were in danger of death. One man is still critically ill. The post surgeon is of the opinion that the poison was in the beef.

MANY SOLDIERS POISONED.

Eighty Are Made Ill While Eating Breakfast.

CHEYENNE, Wyo., December 27. — Eighty members of Company F, Eighteenth Infantry, U. S. A., were poisoned while eating breakfast yesterday, and for a time fuly half of them were in danger of death. Before breakfast was over every man in the company had to leave the table, and soon all were prostrated and in great agony.

The post surgeon was hurriedly summoned and administered an antidote. Forty of the men who sat down first were in bad shape and vomited vigorously. The antidote administered relieved all of them, and last evening most of them were able to be about. One old man, however, whose name was not ascertained, is critically ill.

The surgeon examined the food served at breakfast, and is of the opinion that the poison was in the beef.

DISEASED MEAT BEING SOLD

Chicago Butcher Is Arrested by Government Officials.

CHICAGO, Jan. 13. — Prosecution against the venders of diseased meats in the stock yards district has been revived by the government officials who have been investigating the matter for several weeks past. The arrest of Fred Hess, a butcher at 2063 Halstead-st., was made today, as the result of disclosures said to have been made by Ferdinand Evon, who was brought back from Detroit late Sunday evening. Hess is charged with having removed government tags from condemned carcases of beef. He will have a hearing Wednesday before United States Commissioner Foote, and Dr. Oren E. Dyson, government inspector of meats at the stock yards, will be present to prosecute him.

INFECTED PORK AT FAULT

...the divorce court."

...W PORK KILLS A GIRL.

...iosis Fatal in One Case and ...akes Other Persons Sick.

...AUKEE, December 8. — Mary ...e twenty-one, is dead, and her ...oseph Fiala, and sister Rose are ...ating raw chopped pork. Trichi... the cause of death and illness. ...s ago the members of the Fiala ...e raw pork with vinegar and ...e sickness that resulted was at ...osed as typhoid fever by Dr. ...effel, the symptoms being sim...y respects in both diseases. ... says it is estimated that 3 ... pork is diseased by the pres...e germs, and unless it is thor...ed it should not be eaten.

SELL DISEASED HORSE MEAT

CHARGES AGAINST FOUR CHICAGO PACKING-HOUSES.

USE BROKEN DOWN NAGS

Illinois Assistant State Food Commissioner Stirs Up Retail Merchants' Association.

CHICAGO, February 12.—A special from Aurora, Ill., to the Record-Herald says: Old and diseased horses and mules are slaughtered and sold under the name of beef by four large packing-houses in Chicago. Fish that have died a natural death are a regular article of merchandise in some sections of that city. And in no part of Illinois is there any protection to the consumer against flour that is adulterated with the mineral barytes and against the deleterious, impure vinegar which St. Louis sends into the State in large quantities.

These disclosures were made by Assistant State Food Commissioner R. M. Patterson, in an address delivered before the Retail Merchants' Association of Illinois.

"The inspectors of the food commission," said Mr. Patterson, "have located in Chicago four slaughter houses for horses, mules and donkeys. Real beef is never handled in these places, but their delivery wagons run to markets, restaurants and free-lunch saloons with great regularity.

"Hardly a horse, mule or donkey is ever too aged or diseased to be handled, and none other than such animals is slaughtered, for healthy equine animals are too valuable to compete with beef and mutton for food purposes. Ring-boned, spavined and sore-footed nags, and even those that have glanders, are killed in great numbers for the trade.

"The meat is sold for corned beef, hamburger steak and sausage. In the fall of the year much of it is pickled or preserved and sold as pickled or canned beef.

Mr. Patterson said that the slaughterhouse men were bold enough to advertise in the papers for animals. He gave no names, but read the following advertisements:

HORSES WANTED FOR KILLing—Ambulance for crippled horses. Send postal card.

WANTED—ALL KINDS OF horses, $2 to $20; will call for them.

HIGHEST PRICES PAID FOR killers; want all kinds of sore-footed horses; will call.

HORSE MEAT FOR FOOD

TALK WITH NATIONAL CHEMIST WILEY, OF INDIANA.

HE EXPLORES MANY FIELDS

Investigation of Our Preserved Foods and the Products of Our Vineyards.

WASHINGTON, February 14.—An indication of the wide range of Agricultural Department activity could have been obtained in the office of the official chemist of the department several days ago, when Dr. H. W. Wiley looked up from his desk to talk on some features of his work during the past year, says the Star. In one corner of his office were several stalks of sugar cane. A bottle of Georgia sirup served as a paper weight. Unopened cans of meat and meat extracts were ranged in a row on the window sill. The floor was a storehouse for small bottles of wines, ciders, and other fermented beverages. The general view was that of a "jobber's" or wholesale office, and it bespoke a field of interests much larger than that of any wholesale business in the United States.

"Preserved foods and American wines have occupied the men of this bureau a good many months the past year," said Dr. Wiley, casting his eye over the meat cans and wine bottles. "Next year we shall extend our examinations and specialize, but for the past ten months or so we have burrowed into the whole field of those two commodities with the most practical results.

"We devoted ourselves chiefly to preserved meats, especially the canned meats of various kinds and the delicatessen of animal origin kept in high-grade grocery stores. In order to have a solid scientific basis for these investigations, fresh meats were obtained, their composition was determined, and then the meats were canned in the ordinary way. After a time the cans were opened and the meats they contained were subjected to chemical examination. By this method a direct comparison was secured between a great number of meat products examined and the original fresh products from which they were made. The amount of chemical work involved in this examination was of great magnitude, and the bulletin containing the data of this work will consequently be of a bulky nature.

Horse Meat in Sausage.

"An elaborate investigation was also made of the character of horse meat, with the object of determining whether or not it is sold surreptitiously in this country for beef, and also to determine whether or not, when mixed with other meats, as in the instance of making sausage, the parts derived from the horse could in any way be identified. The two obvious methods of procedure which would be naturally suggested in this case were followed. That is (1) the microscopic examination of the meat fibers, and (2) the determination of the chemical composition of the mixtures. To this end, mixtures of horse meat with other meats in known proportions were made, converted into sausage, and afterward given to the analysts without their knowledge of its contents, for the purpose of determining whether or not horse meat was contained therein. The microscopic efforts in this line were futile, since it was not possible to discover with certainty the fibers due to horse meat in a mixture of that meat with certain other forms previously subjected to the vigorous action of the sausage grinder.

"In the study of the chemical composition as a means of discrimination between horse meat and the other kinds of flesh more favorable results were obtained. The meat of the horse contains quite a large quantity of a sugar-producing substance known as glycogen. Other common edible meats, with the exception of the meat of the lobster, crab and crayfish, contain only small quantities of this substance. It is evident, therefore, that a determination of glycogen in a mixture would be a valuable indication in regard to the origin of the meats therein, in so far as the horse is concerned. When the elucidation of this problem was begun, however, it was discovered that none of the accepted standards of examination was satisfactory. It was, therefore, first of all necessary to develop, by modification and otherwise, a method of determining glycogen in horse meat which was reasonably accurate. This, happily, was accomplished, and we were then able to detect the presence of horse meat in a mixture, provided the amount thereof was not reduced to too low a percentage. Working with the greatest care, it is believed that as little as 10 per cent. of horse flesh with beef can be detected with certainty by the methods used in this laboratory.

Products for Sale Abroad.

"A particularly promising feature of our work here in the chemical laboratory is the investigation of foods intended for export to foreign countries where such tests are required of foods offered for sale. Unfortunately we were given no appropriation for carrying this work into effect, and, therefore, it has not been possible to institute the control contemplated when Congress authorized us to inspect such foods. Full preparation, however, has been made for the inception and prosecution of this work whenever the funds are forthcoming, and as a preliminary step a careful study of the foreign laws regulating the sale of foods has been made.

"In collaboration with the viticultural associations of the country, we have accomplished a wide work in studying the composition of American wines.

"This work was particularly opportune in consequence of the exhibition of a large number of standard American wines at the world's fair in Paris. Not only were our own wine makers gratified, but the wine growers of Europe were somewhat astonished at the fine showing made by our wines in Paris. More than 90 per cent. of all the samples exhibited received awards. When it is remembered that only about 40 per cent. of the objects exhibited received recognition, this high number for our own wines is extremely flattering. Among the awards was a large percentage of gold and silver medals, and, in one instance, an American wine was marked the highest possible number below that which would have entitled it to the grand prize, viz., 18 on a scale of 20. Had it not been that the particular wine in question bore as parts of its label names indicative of foreign origin it is probable that it would have received the grand prize.

American Wines Are [illegible]

"Not only the Americ[illegible]
what is [illegible]re s[illegible]
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TEN-DOLLAR BEEFSTEAKS.

That Is the Price of a Sirloin Cut from the Flanks of Jute II.

CHICAGO, December 8.—Ten-dollar beefsteaks. This is the prospect for New York epicures.

Jute II, the grand champion steer at the International Stock Show, was bought for $700 by the United Dressed Beef Company, of New York, for New York customers.

He weighed 1,900 pounds. His price the pound was 36 cents on the hoof. Ordinary beef, bringing four cents on the hoof, retails at 28 cents. By a simple calculation the retail price a pound of Clear Lake Jute II is shown to be $5.52.

An extra sirloin served in a fashionable downtown restaurant for $1.25 weighs four pounds. When cut from the aristocratic flanks of the champion steer it will cost over $10.

The Jute II price is the highest price paid for a live steer at any of the stock shows.

WHOLE FAMILY IN PERIL FROM POISONED MEAT

Ptomaine poisoning, supposed to have started from meat which they ate for breakfast this morning nearly caused the death of Henry Hecht, Mrs. Hecht and their year-old child, all of whom reside on the Hecht farm, four miles west of town. Dr. Duerinser was called to see them this noon and after a hard fight thinks he has all three of the family on the road to recovery.

Mr. and Mrs. Hecht first noticed that something was wrong through the actions of the baby, which began to cry soon after breakfast, and appeared to be suffering great pain. While endeavoring to relieve the child's sufferings Mrs. Hecht was also stricken, and Mr. Hecht had just time to summon a neighbor to his home before he was stricken down.

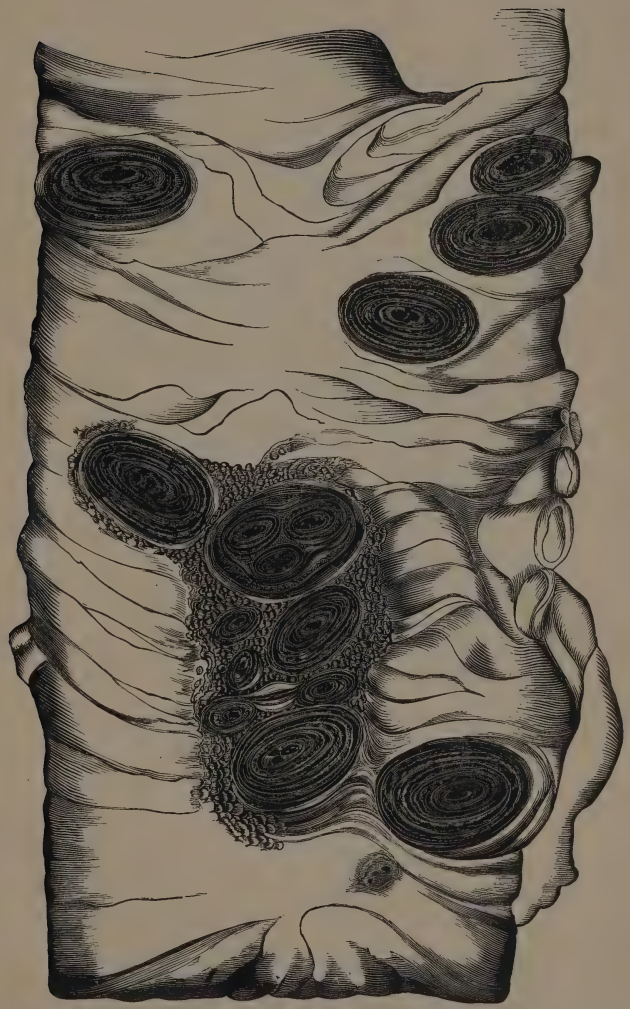


PLATE 6.—CÆCUM OF HOG WITH INDURATED NEOPLASTIC PRODUCTS OF EMBOLIC ORIGIN.

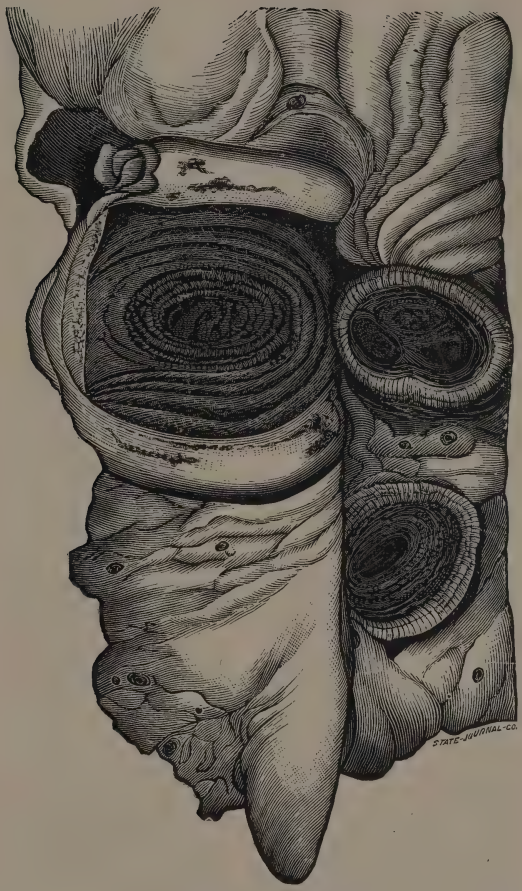


PLATE 17.—CHRONIC NEOPLASTIC INDURATIONS, DUE TO EXTERNAL EMBOLISM IN WALLS OF COLON.

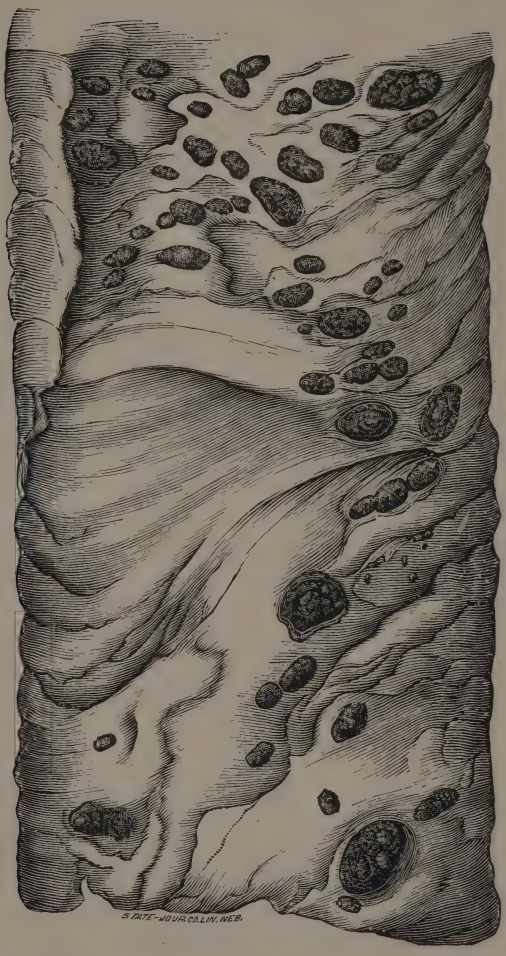
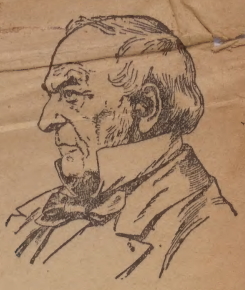


PLATE 8.—ACUTE CASEOUS FOLLICULAR ULCERATION AND PERI-INDURATION IN CÆCUM.

[Copyrighted.]



W. E. Gladstone

(W. E. Gladstone.)

Born this day, December 29, 1809, in Liverpool, England, of Scotch parents. His father made a fortune in trade, and late in life was created a baronet. Mr. Gladstone was educated at Eton, and Christ Church College, Oxford, and was graduated in 1831.

Two great moral qualities stand out conspicuously in Mr. Gladstone's character—honesty and enthusiasm.

Notwithstanding his greatness as an orator, statesman, financier, scholar, man of letters, critic, he rose to his greatest hight as a personality as an influence on his century. Men are usually great by what they have done—Mr. Gladstone was greater than his deeds. He towered above others with a simplicity that was complex. His ideal was duty.

He had consuming zeal and magnificent mental endowment. He read omnivorously and wrote on a score of topics from theology, Greek prose and questions of state—to forestry and female novelists. He had many hobbies. He was an excellent violinist, collected porcelain, chopped down trees. He has been known to smoke, but was not a great friend to tobacco. He was a careful eater and drinker. His married life was one of singular felicity.

He had eight children, but only h third child, Miss Helen, seems to ha any of her father's versatility and e thusiasm.

Mr. Gladstone was a slight, lean m of medium hight, yet his figure was co manding. His head was superb and large piercing gray eyes were remarke for their brilliancy. His nose was pro nent, his mouth was stern. His lo jaw was ... and powerful. His v wonderful and seemed to impr with age. He had a scant fringe of wh hair, and always wore old-fashion clothes. He usually wore a long, ill-f ting frock coat, low-cut waistcoat a plaid trousers. The caricaturists ha made him famous with rumpled and vo luminous shirt front and wide-winged co lar.

With instinctive reticence they never called attention to the fact that Mr. Gladstone had lost three fingers on his left hand, and in consequence was always seen with a glove or a black patch on that hand.

Mr. Gladstone was one of the greatest orators of the century. Cobden said it was useless for anyone to speak after Mr. Gladstone, as he always exhausted a subject and left nothing to say.

Every great reform that was proposed first saw Mr. Gladstone as its opponent and then its advocate. He had the courage of many sets of opinions. His career is a study in evolution. He began life a Tory, with a belief that popular government was anarchy. His first speech in Parliament was a defense of colonial slave-holders.

He married Miss Glynn in 1839, and she is supposed to have had much influence in changing his views. From Tory he altered his views to Conservative-Liberal, and then by conviction became an out-and-out Liberal. His last speech as Premier was an attack on the House of Lords.

Mr. Gladstone will never be thought great for his foreign policy. In foreign affairs he was a negative force. His greatest mistake seems to have been his failure to rescue Gordon.

He was probably greater in finance than in any other branch of public business. He was a pupil of Sir Robert Peel.

The last years of his life were devoted to home rule for Ireland. He fought with the enthusiasm of youth and the stubbornness of age, but he failed.

It was always thought possible that he might disestablish the English church as he did the Irish in 1869. He swept away the last of the disabilities imposed on Jews and Catholics, and later he advocated the admission of atheists to Parliament. His sympathies were as wide as modern thought.

Mr. Gladstone died May 19, 1898, at Hawarden. He was buried with the highest honors in Westminster Abbey, on condition his wife should share his grave.

SECRET SOCIETIES.

On January 17 there will be the first regular meeting of the committee appointed by the Grand Lodge of Indiana Odd Fellows, for the purpose of undertaking arrangements for the Sovereign Grand Lodge meeting, in this city, next September. There are nine regular members of the committee and four ex-officio members. Although the meeting of the Sovereign Grand Lodge is many months off, the committee which will arrange for the meeting believes that early work will be most effective. The subcommittees will be announced at the meeting, on January 17. There will be several of these. The committee already has $7,500, the nucleus of a fund for entertaining visitors.

* * *

The matter of establishing a home for aged and indigent coal miners is again being discussed. The miners have no secret order, but thousands of them belong to the Odd Fellows, Elks, Masons, Knights of Pythias and other secret orders. It is asserted by miners who favor the home project, that an assessment of a few cents a month on the members of the United Mine Workers would soon provide for a home and funds for maintaining it.

* * *

The Knights of Pythias will hold several district meetings next month. Frank Bowers, keeper of records and seals, of the Indiana domain, is receiving reports from lodges throughout the State. The showing for the second term of 1900 will be the best ever made.

* * *

The Order of Colonials, recently established with national headquarters in this city, is securing new members at a rate that will give the order a membership of more than 1,000 by January 1, the officers say.

* * *

Naomi Rebekah lodge, No. 159, at Richmond Center, Fulton county, Indiana, has been resuscitated, and starts off with a good membership.

* * *

The Scottish Rite members expect to observe the last night of the century, and will provide a program of entertainment.

* * *

It is understood that at least a dozen Indiana Mystic Shriners will make the long journey to Honolulu, starting January 17, for the purpose of instituting a lodge in that city. The imperial potentate of the order will be among those going. The instituting of the lodge will not be an expense to the Supreme Council, as all persons who make the long journey will pay their own expenses. One of the finest trains ever built by the Pullman company will carry the Shriners from Chicago to San Francisco, via the Southern Pacific railroad route.

* * *

The grand patriarch of the Indiana E campment is preparing for a great d of work after January 1. He has pointed his deputies, who will at o begin an active campaign in almost ev county of the State.

For a Cold in the Head
Laxative Bromo-Quinine Tablets.

...LER DENOUNCES WI...

FORMER WAR SECRETARY RE-...EARSES BEEF INQUIRY.

Asserts that Eagan was Sacrificed to the Scandalous Charges of the Commanding General.

NEW YORK, December 29.—The North American Review, in its next issue, will publish a long article by former Secretary of War Alger. The ex-Secretary writes on "The Food of the Army During the Spanish War." He first refers to the appointment by the President, at his request, of the Dodge commission, to investigate the conduct of the War Department in the war with Spain, cites the fact that General Miles refused to be sworn when he gave his testimony, and then continues:

"Although the commission had been sitting nearly three months, the charges with respect to canned and refrigerated beef were now made for the first time; and, stranger and more inexcusable and more unsoldierly still, during all those months, with this pretended knowledge of facts which, if they existed, should have been made known to the Secretary of War for the protection of the army—General Miles never mentioned the subject. Nor did I ever hear a rumor of chemically-treated beef being purchased for the army until the general's testimony was given before the commission. In answer to inquiries as to how canned beef became a part of the army ration, General Miles said:

"'You had better ask the Secretary of War or the commissary-general; I think they can tell you. I know it was sent to the army as food, and the pretense is that it was sent as an experiment. * * * There was sent to Porto Rico 50 tons of what is known as or called refrigerated beef, which you might call embalmed beef. * * * Now, if you want to ascertain the cost to the Government of this so-called refrigerated beef—embalmed beef—take the original cost. * * * I do not know what may have been injected into it. * * * The understanding is that there is a secret process of preserving beef. * * * It may be that they are still sending the stuff down there. I don't know. * * * If I was furnished for any expedition in this country, or any other, with such stuff, would prohibit the men from taking * * * I do not think that beef such was sent to Cuba and Porto Rico uld be good in any country in the mach of any man. * * * They ld get some bacon, but that is not sidered suitable food for the troops. * * You ask about food. In my ...that was one of the serious ...es of so much sickness and distress ...he part of our troops.

Fell on Eagan's Shoulders.

Not contented with his grave and ndalous charges, made public for the st time before the War Investigating mmission, General Miles permitted mself to be interviewed on the follow- g day at Cincinnati, where he made milar charges. The allegations that unitable food, not a part of the legal ralion, had been furnished the army under pretense of an experiment, and that refrigerated beef, treated with poisonous chemicals, had been and was being supplied to our army of 275,000 men, were, indeed, serious, implying, as they did, criminal incompetence on the part of the Commissary Department, if not willful negligence and dishonesty. Upon Commissary General Charles P. Eagan the charges fell with the suddenness and sharpness of a blow from an assassin's knife out of the dark. No other supply bureau of the army had excelled the Commissary Department in promptness, efficiency and successful administration during the war.

"Upon hearing them, he pitifully exclaimed:

"'General Miles has crucified me upon a cross of falsehood and misrepresentation.' General Eagan had already been examined by the War Investigation Commission when General Miles's hearing occurred, but when the testimony of the latter appeared in the newspapers General Eagan immediately requested a rehearing.

His Unfortunate Reply.

"General Eagan read his reply to the war investigation commission from a carefully-prepared typewritten manuscript. Lashed to the quick by the allegations contained in General Miles's testimony and in his subsequent interview, which appeared on December 23, in a New York newspaper, his indignation exceeded the limits of his self-control, and in his efforts to deny the charges made, his language became vituperative, extravagant and highly improper. I believe that, had General Eagan's health not been seriously impaired by overwork and anxiety, the two objectionable paragraphs of 300 words, out of an aggregate ...ized in [illegible] reply—would ...been stricken ...tered. Even yet, divested of its offensive adjectives in the two paragraphs referred to, his reply to General Miles remains unanswerable in its logic and incontrovertible in its facts. The allegation that I had inspired or had any knowledge of General Eagan's intended attack upon the statement of General Miles is absolutely untrue.

He Stands by Eagan.

"The suspension of General Eagan from the functions of his office until his retirement stripped the service of an honest and able officer. His court-martial was not the outcome of General Miles's charges, but the result of intemperate and unmilitary language, conceived in an indignation pardonable in its mode of expression. General Miles seemed to be pleased with the notoriety which his startling statements before the commission, and his subsequent newspaper interview gave him, for again, on March 31, 1899, in New York city, he published additional charges. This interview, which appeared on the morning of February 1, General Miles was called upon to deny under oath, and, as he was unable to do so, part of his statements in it were used by the court of inquiry as a basis for investigation.

"Of the witnesses examined by the investigating commission, General Miles and Dr. Daly are the only ones who make the charge of 'chemically treated beef.' Astounding as this statement may seem, General Miles did not base his allegations upon personal experience or submit any proof in support of them. His startling and scandalous accusations appear to have been based entirely upon the verbal statements of Dr. W. H. Daly, a volunteer major and surgeon upon his staff during the war with Spain, and upon a single letter subsequently sent him by this volunteer. The allegation that the food furnished the army was the cause of much sickness seems to have been as little investigated or to have had as little warrant for its utterance as the other disproved charges.

"The army had won its battles in Cuba and the Philippines, Porto Rico had peacefully came into our hands after a few skirmishes, the protocol had been in operation for over four months, and even the treaty of peace had been signed at Paris. Then comes the major-general commanding the army of the United States with his charges. While the allegations of General Miles were not based upon fact, and were conclusively disproved by two separate tribunals, unimpeachable in their composition and methods of investigating, the irreparable damage had been done.

"A brave, honest and faithful officer, suffering under the lash of such cruel, unwarranted and unjustifiable imputations, while exonerated from the heavy odium of those charges, was, as a result of them, sacrificed on the altar of his own passion, righteous in its existence but inexcusable in its expression. Besides this, a false impression has been created throughout the country as to the food furnished the army which may never be removed. The charges of General Miles, twice proven false in spirit and substance, are, therefore, the more ...inous in their effect. Yet the present ...ngress promoted General Miles to lieutenant-general, and has thus far failed ... give General Shafter the rank of ...ajor-general to retire upon in his old ...e, and this after his magnificent cam...ign at Santiago, as well as his former ...tinguished services."

FIRE NEAR MATTOON.

...om Corn Warehouse in Ashes—Loss Twenty-Five Thousand.

[Special to The Indianapolis News.]

...TTOON, Ill., December 29.—The big ...n corn warehouse of J. C. Fleming, ...llenville, eight miles from this city, ...destroyed by fire. The origin of the ...igration is a mystery. A large